

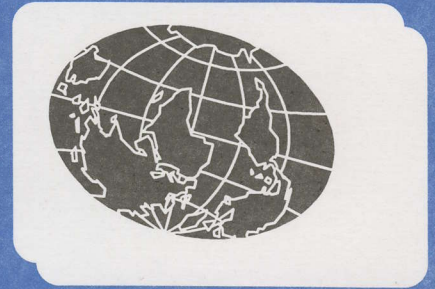
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Bob Cooper's

October 15 2000

SatFACTS

MONTHLY



Reporting on "The World" of satellite television in the Pacific and Asia

IN THIS ISSUE

FEEDS.

**More than you
want to know.**

**2.4 Gigs:
Community relay
systems**

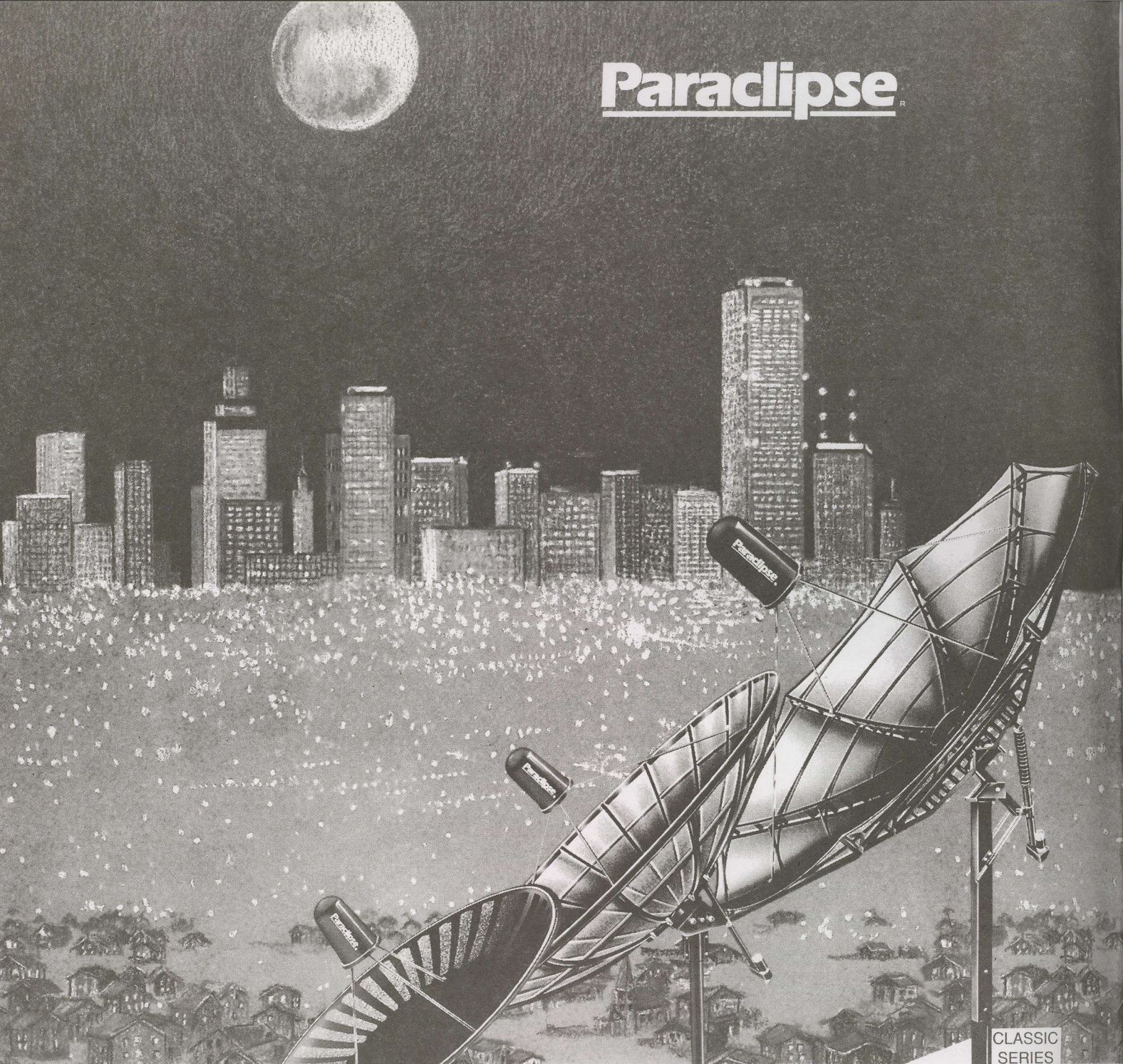
**Russia abandons
Pacific; SMPS
noise**

- ✓ Latest Programmer
News
- ✓ Latest Hardware News
- ✓ Latest SPACE Pacific
Reports
- ✓ Cable TV Connection

Vol. 7 ♦ No. 74
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(updated October 15, 2000)

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SPACE Pacific Report (# 9901, 9902, 9903, 9904)

The television programme, direct to you from digital master on E240 VHS tape, PAL format of course. Show 9901: "It is your signal, too" and "Fun and games with the spectrum analyser." Show 9902: "Feeds and LNBs" - understanding how products differ. And, "Mark Long's Thumbnail History of home satellite TV" featuring the real pioneers of the 70s and 80s! Show 9903: "Dish antenna critique," why some dishes work better than others, plus Mark Long on installing your own dish, and, Richard Brooks on PVRs. Show 9904: "Who buys DTH systems?" explores the marketplace, plus, "Understanding Tiny Parts" looks at connectors, line-amps and splitters. Four hours as currently running on Mediasat - digital mastered to you for the exceptional price of \$55 including shipping and bonus item - "Satellite Television (The Booklet)" featuring material by Sir Arthur C. Clarke. In stock, typically shipped within 72 hours. (No SPACE discount)

Shows 9905, 9906, 9907, 9908 & 9909

The television programme - series two releases (as broadcast Sundays on Mediasat). As above. Show 9905: Robin Colquhoun and the Dr Overflow software for the Nokia; Show 9906: How the uplink works - possibly the best programme topic ever created. Show 9907: Part two of uplink. Show 9908: Instructor Mark Long's "Digital Basics." Shows 9905, 6, 7 & 8 now being shipped. \$60, no SPACE discount.

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FTA terrestrial to multiple outlet sets. With DVB-T coming, this excellent step-by-step guide to proper master antenna system design and installation will prepare you for the far more complex world of distributing MPEG terrestrial digital signals around a home, multiple dwelling unit, motel or hotel. Basics of analogue distribution still apply - even with digital! Ltd Qty \$10 (SPACE discount)

TB 9404 DTH Systems

Direct to Home: Satellite System Installation Techniques. There are many-many NEW people getting into home satellite system installation. And we receive several calls each day asking us to point them at a "basic tutorial" that will explain how a home dish system works, how you install it for proper performance. This is it. Without question, the very best *quick* tutorial on what a home dish system is, how it works, where the problems develop. If you are new to the DTH field, buy this and commit it to memory. Very slight New Zealand bias, not enough to hurt its value world-wide. And if you are looking into multi-set installations such as motels and hotels and condominiums, also order TB 9405 'SMATV Systems' (below; the pair make it painfully clear where mistakes are commonly made). Also see SatFACTS October, November, December 1999 - for RF Distribution System articles. TB9404 originally prepared by Coop for an Asian DTH technology conference, LtdQty \$10 (SPACE discount).

TB 9405 SMATV Systems

Satellite to room - Commercial SMATV (Satellite) Dish Installations. The easy part is the satellite dish or dishes. The difficult challenge is getting all of those signals - including the terrestrials - balanced and into every room and each TV outlet at the proper level. If you plan to do multiple-outlet systems, start here with this Coop written tutorial. LtdQty and only \$10 per copy while they last! (SPACE discount)

Nelson Parabolic Manual

The Nelson Parabolic TVRO Manual. If you are the type of person who wants to build your own dish (up to 3.7m in size), or, you simply want to understand why some dishes work better than others, this step-by-step "how to build a dish" manual is the "Bible" of an industry. Nelson Ethier was a perfectionist and brilliant with hand tools. It shows here - the ultimate backyard project! Half original price at \$15, LtdQty, SPACE discount applies.

SPACE Pacific Order Form (also see SPECIAL PACKAGES on reverse side)

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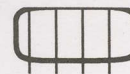
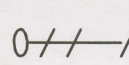
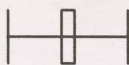
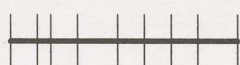
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SPACE Pacific Terrestrial TV Reference Materials



Each of these editions researched, created by "Coop" to help you solve tough aerial problems

**TB
9301**

Tech Bulletin 9301. Co-Channel & Antenna Phasing. How to grow a single antenna (Yagi, broadband antenna) into a complex array to greatly increase gain, sharpen receiving pattern to eliminate co (same) channel interference. Totally hands-on, very practical, up-to-date. Go from novice to professional!

**TB
9302**

Tech Bulletin 9302. Weak Signal Reception Techniques. If one cut-to-channel (Yagi) antenna won't do the job, will 2, 4 or 8??? How about 16? Stacking antennas, mating with carefully selected masthead amps, is an art. This explains how to do it for professional results up to 300 km from TV stations.

**TB
9303**

Tech Bulletin 9303. UHF - The Frontier. Using parabolic style antennas surfaced with low-cost poultry mesh, build UHF dishes up to 40 feet in size to extend UHF off-air reception out to 300 km. And - learn the tricks to "squirt" signals from a hilltop to a valley below using low-cost receiving equipment.

**TB
9304**

Tech Bulletin 9304. Beating Noise Interference & Combining Cross-Pole Signals. When TV and FM signals are weak, man-made interference from appliances, power lines can kill reception. Step-by-step instruction for identifying, locating, fixing noise sources + unique method of combining cross-pole TV signals.

**TB
9305**

Tech Bulletin 9305. Cable Television - Fact & Fiction. The story of how a cable TV system is designed, built, operated. The perfect "So this is how it works!" report. Who knows - you might even like the concept so well you take out a mortgage on your home and wire your town!

**Lost
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- ☐ TB9301/9302/9303/9304/9305 - \$40 -or- ☐ Rhombic/ 20-40' Dishes/ Half Bolics - \$50 -or- ☐ TB9301/9302/9303/9304/9305 + Rhombic/20-40' Dishes/Half Bolics - \$80.

Total of order - \$ _____; If current SPACE member, multiply total by 0.7 to obtain discount price (NOTE: No discount applies SPACE Pacific Report video) - new discount total \$ _____. I wish to pay this by ☐ Cheque (enclosed) ☐ VISA ☐ Mastercard

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SatFACTS MONTHLY

ISSN 1174-0779

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This publication is dedicated to the premise that as we are entering the 21st century, ancient 20th century notions concerning borders and boundaries no longer define a person's horizon. In the air, all around you, are microwave signals carrying messages of entertainment, information and education.

These messages are available to anyone willing to install the appropriate receiving equipment and, where applicable, pay a monthly or annual fee to receive the content of these messages in the privacy of their own home. Welcome to the 21st century - a world without borders, a world without boundaries.

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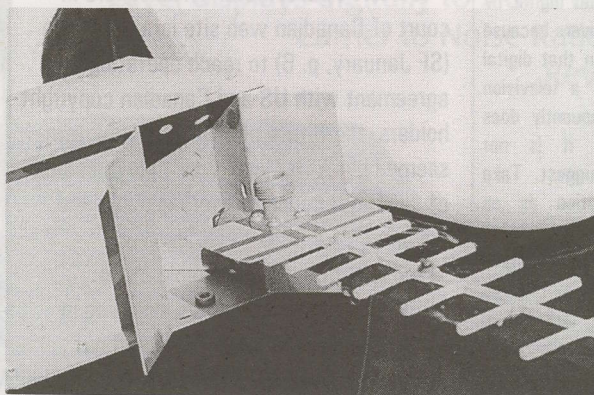
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COOP'S COMMENT

Hand delivering the page masters for SatFACTS September to our printer on the way to the Auckland airport, Gay, Seth and I boarded a United flight to California and three weeks of family visits and technology researching. More than two years has passed since our last visit and in that interim digital terrestrial has become big business there. Our CTD publication has written extensively about the problems the



October 15, 2000



Americans have experienced getting HDTV digital terrestrial underway and I wanted to experience their results to date with my own eyes.

At the same time I arranged meetings with Mike Staal of M-Squared antennas (Fresno, California - see front cover) and John Ramsey of Ramsey Electronics (Victor, New York) to explore what seems to be a very promising new way to redistribute satellite TV reception

on the ground using 2.4 GHz unlicensed transmitters. Both Mike and John were pioneers in the creation of C-band home dish technology in the early 1980s and if you have watched the SPACE Pacific Report TV series, you've seen Ramsey in several episodes (usually with a red can of Coke at his fingertips).

Mike's firm does contract antenna design work for NASA and other high profile clients and very few know and understand high gain antenna systems for 3 MHz to 10 gigs better than Mike. Ramsey's product line now includes 100 mw through 300 watt self-contained, desk top fully commercial quality stereo FM radio transmitters, transmitting antennas, and TV transmitters in the 430, 900, 1250 and 2400 MHz ranges. I figured between Mike's antenna smarts and John's transmitter savvy, there had to be a marriage of a "system" which would find wide application in the Pacific and Asia. I was not disappointed and over the coming months you will see, here and at SPRSCS 2001 in Melbourne, exactly how inexpensively FM and TV radio transmissions can be generated and used to "share" satellite reception with a block of homes, a neighbourhood, even a small town. We begin this exploration in a very rudimentary way on pages 18 and 20 in this issue.

One of Mike's innovations is a "waveguide combiner" to join together two (or four) separate S-band (2.1 to 2.7 GHz) high gain yagi antennas into an "array" with gain challenging smaller parabolic dishes. The waveguide combiner overcomes losses associated with coaxial cable combiners; a segment of 2.6 GHz waveguide and the feed end of a 2.6 GHz yagi is shown above (also see our front cover). Mike "stamps" out microwave yagis in cookie-cutter fashion - antennas begin as flat sheets of metal, stamping creates precise boom plus element configurations, each antenna *exactly* alike for perfect phasing. *Ahead?* Whole new techniques to bring satellite to the home.

In Volume 7 ♦ Number 74

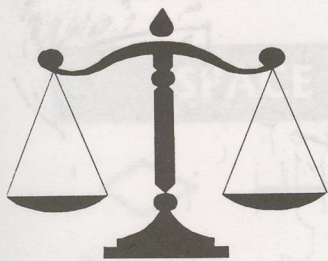
FEEDS - More than you wanted to know! -p. 6
2.4 Gigs - Distributing in your neighbourhood -p. 18

Departments

Programmer/Programming Update -p.2; Hardware/Equipment Update -p. 4; SPACE Pacific Report (More about 2.4 Gig opportunities) - p. 20; Cable TV Connection (Remote monitoring of power supplies) - p. 22; SatFACTS Digital Watch -p. 24; Supplemental Digital Data -p. 26; SatFACTS Analogue Watch -p. 27; SPACE Pacific Report - TV Show schedule -p. 28; With The Observers -p. 29; The American scene -p. 31; At Sign-Off (SMPS interference) -p. 32

-ON THE COVER-

This is an S-band (2.6 GHz) yagi created by M-Squared of Fresno, California originally for Arabsat. One yagi array has around 19 dBG, two stacked should do the job for present-day Cakrawarta and for 2.4GHz terrestrial - super arrays! (p. 18)

**Disagree with digital TV editorial**

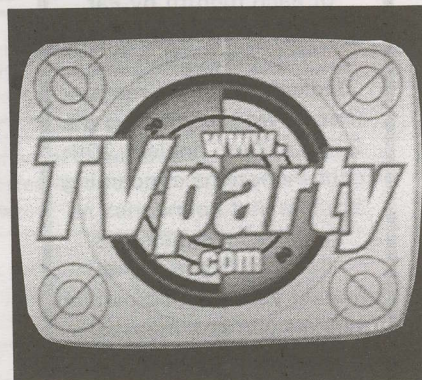
"I do not agree with your premise (that digital TV thuput is not available in DTH home receivers because of copyright concerns) or your suggestion that digital has artefacts. Processing part or all of a television stream in a digital manner can and frequently does provide qualitative improvements and it is not necessarily only about costs as you suggest. Take conventional analogue terrestrial reception as an example. The main 'impairments' suffered by the viewer are noise, ghosting, and resolution loss. Does digital significantly reduce these impairments? Yes. I would suggest the reason that domestic IRDs lack digital outputs is the lack of a common format and the consumer being unwilling to pay the cost of adding a digital monitor for viewing the service. Professional grade monitors with digital inputs are reasonably common internationally but they presently don't work with MPEG - only with 270 Mbps SDI standard streams. And the top end commercial IRDs (used by broadcasters) offer digital output options as well, using the SDI standard. In the end what does this mean? Credibility and integrity - the editorial lacks both to the point of exceeding whatever 'licence' as might apply to such a column."

Name withheld upon request

We said digital will never be digital until the system is seamless from the original material to the viewing screen. Just one "analogue" link and the chain is broken. That digital throughout IRDs are not going to happen routinely until the copyright issue is solved is not our conjecture - one has to but monitor the daily reports from the USA and UK. One UK firm now offers to "rebuild" a stock BSkyB IRD adding digital throughput and marry it to a 42" Plasma digital display monitor for the outrageous price of US\$18,000. Their literature plainly states that any circumvention of their "firewall" system that is intended to prevent direct digital copying (taping, hard drive storage) from the modified BSkyB receiver will subject the user to "copyright violation penalties." As for digital artefacts - our September trip to USA including visiting several dozen 'Circuit City', 'Best Buy' chain stores where American HDTV from local terrestrial transmitters as well as through DirecTV and DISH satellite services was on display. A PBS (Public Broadcasting System) 15 minute programming loop was used by most to display HDTV. The first 12 stops all had 50 to 72" HDTV displays running and if you tried to watch the full 15 minute loop, on average it broke up with an on screen message "signal not available" 3 times. We would classify this as a "major digital artefact." Only at the 13th stop did we view the full 15 minute loop without break up. We also visited the editing studio for "Everybody Loves Raymond" and tried switching through their 60" HDTV off-air receiver for the Los Angeles HDTV channels. Four were missing even after they had spent "more than US\$5,000" to get a working off-air antenna system installed; *some artefact!*

**PROGRAMMER
PROGRAMMING
PROMOTION****UPDATE****OCTOBER 15, 2000**

www.TVparty.com. After failure in court of Canadian web site icraveTV.com (SF January, p. 6) to reach operating agreement with US and Canadian copyright holders, the future of "live TV" via Internet seemed bleak. If "live" won't play because of copyright concerns, perhaps "old and memorable" will. Try <http://www.TVparty.com> for an incredible mix of 1950-1980's era TV shows including in particular product taped or filmed but never actually making the airwaves ("Ralph Williams Ford" advertisement under category 'Most Outrageous Commercials'). Equally outrageous, clips of divan Mae West including her famous, "Is that a gun in your pocket or are you just glad to see me?"



New Canadian company (JumpTV) carefully planning revision of icraveTV format from Quebec web site, has asked Canadian copyright authorities for ruling of proposed plan to collect viewing fees and pay copyright for each viewer.

European bouquet concerns. Bouquet manager DW announced late in August plans to increase from 5 to 8 video channels, no detail on what will happen to present 20+ audio services. We felt (and posted on our web site) this *could* result in reduced performance for marginal (such as 1.8m) dishes in Australia and elsewhere. DW's Hermann Josef Fuchs was one disagreeing with our suggestion. "There will be no changes on the transmission parameters at all (transponder 10B/4,000 MHz Hz, Sr 28.125, FEC 3/4). What has already happened is a reduction of the DW video bit rate from 8 to 4 Mbits which means a maximum of 8 (TV programmes) can be transmitted." Also disagreeing, Steffen Holzt of Antenne-Cal in New Caledonia. "EBB is currently operating with Sr 28.125 which relates to 28.125 MHz of occupied bandwidth. If they maintain this bit rate ($28.125 \times 2 = 56.250$ Mbps) the new channels added will share the same 56.250 Mbit and the Eb/No should not suffer. That would be an average of 5.3+ Mbit per channel - an amount superior to current DTH line-ups in the Pacific. I cannot see where your assumption comes from that the dish size needs to be increased after they add new channels." Well - RTPi is already there, they call it a "test" but say it will become "official" in January. And we have reports from Victoria of 1.8m systems that no longer work. Several dozen reports. Sure, 1.8m was marginal to start with, but if the eirp (footprint level) has not changed, then how does one explain the reports of no service?

Total Russian confusion. First NTV shut down on 130E in mid-September, then MCPC bouquet companion THT shut down at end of month. First reports said both would return by October 2, that NTV was pulled from Asia-Pacific beam "because it was carrying heavy schedule of Olympic coverage" for which copyright conflicts arose outside of Russia. As SF goes to press, Alfred May of Delta Systems Pty Ltd (Adelaide) advises, "TARBS is now offering 2 Russian channels - NTV+ and NTV/THT, effective immediately at approximately A\$62 per month. It seems more than coincidental that the cessation of transmission from LMI-AP1 should occur at the same time TARBS announces their latest venture." Bottom line? It does not look good for Russian viewers depending upon C-band FTA services. And if outside of Australia, where TARBS is not available - *too bad!*

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EP313 has been designed in response to demand for a high quality accurate and durable instrument for terrestrial and satellite TV measurements that won't break the bank. Finding signals anywhere in the 45 to 2,150MHz range is easy in Spectrum mode and sensitivity down to 20dBµV allows the weakest of TV signals to be detected. Frequency and level readings can be taken at all times regardless of operational mode. A 100mm CRT with On Screen Display (OSD) provides access to a huge range of functions. Audio Tone and Bar graph simplify peaking an aerial or dish for maximum signal strength whilst Spectrum and Expanded Spectrum modes employ a frequency marker that is easy to see regardless of state. An integrated Video Filter further smooths the spectrum display. Optimizing LNB skew is a snap! In Narrow 100KHz RBW filter allows the instrument to clearly show details including the TV stereo audio sub-carrier all the way up to 2,150MHz. EP-313 is precision calibrated for flatness and then level. Carrier to Noise, Vision to Audio ratio and Digital Channel Power

measurements display digitally and are automatic. All known VHF-UHF and CATV channel plans are factory preset enabling tuning by Channel almost anywhere. Often used channels and data such as TV standard, LNB voltage, 22kHz selection, satellite sub-carrier and video polarity can be stored in 100 Preset positions, saving a great deal of time measuring TV distribution systems. EP-313 can also tune by Frequency either by direct entry or in steps of your choice. Full analogue TV picture can be combined with either level bar graph or sync pulse and colour burst display. Teletext is included as standard. AM, FM and TV audio sub-carrier demodulation enable FM radio and most analogue audio to be heard. The mains power supply included runs the EP313 continuously and recharges the optional internal 6.5Ahr high capacity battery overnight for up to two hours of in field use. Housed in a rugged case that enhances portability, EP313 includes an attractive nylon-based carry bag with accessory pocket and shoulder strap.

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Fat dipoles

"Why a folded (or 75 ohm fed conventional) dipole for a TV antenna (SF terrestrial receiving antenna series, last on p. 12 for September)? Just as the conical or fan antenna (p. 18, September) increases the operating bandwidth of a conventional dipole, so too could you make the bandwidth larger by utilising larger tubing for the driven element. For example, rather than 1/4 to 1/2" diameter elements, use a piece of 4" tubing - even galvanised steel will work. Build the dipole in the conventional manner (p. 12, SF September) with 4" tubing and the larger diameter will immediately increase the bandwidth significantly. Using 6" material, a dipole cut 64.55" in total length (broken in the middle for the 75 ohm coaxial cable connection) will have 0 dB gain (as a dipole should) from 54 to 88 MHz. A 4" diameter 'fat dipole' would be 66.54" in overall length. For reference, a conventional 300 ohm design folded dipole is 1 dB down in performance at 17% bandwidth while a 'fat dipole' gets you 50% bandwidth."

Ed Hanlon, Antenna Performance, USA

Unfortunately, when one adds additional "parasitic" elements to the antenna, the bandwidth collapses in a hurry, even if you used large diameter tubing for the parasitics as well. The 'fat dipole' is basically a variation of the conical (or vice versa) and for the same reason you don't stick passive elements in front of a conical (fan) antenna, you also would not with a 'fat dipole'. On the other hand, a series of 'fat dipoles' each cut for a slightly different portion of band IV/V and arranged in a log periodic format would be very interesting!

Auckland's dish permits

"Reference SF's report (SF August, p. 20) on problems in Auckland suburbs with a dish spy daubing in people with C-band dishes for failure to have permits. I looked at fighting this in court, weighed the costs of the legal battle and the uncertain result against simply making application. After \$562.50 in fees, preparing a site plan and obtaining written consent from neighbours and a local dairy, I seem to be through this trauma. The site was inspected by a City Council Officer and I was promised the permit would be issued. But they didn't say when."

A. Eddie Mobasher, Auckland

Did anyone ever discover who the private investigator, calling himself Steven Norman, was working for? Laurie Mathews advised he checked with the Auckland City agency that registers PIs and they had no record of such an individual actually holding a private investigator's permit.

Comet's worker woes

"What is the trouble with the Comet camp that caused workers to 'down tools'? Does Comet not realise that a satisfied, well paid and content work force is the best investment they can make, as it is the attitude of the installer that is going to make or break the company? The bad press they received on this certainly won't help them attract new installers."

John Young Edgar

Comet workers basically walked away from the firm in some areas during September and ABC TV and others reported this throughout Australia.

HARDWARE EQUIPMENT PARTS

UPDATE

OCTOBER 15, 2000

Autosat's DB 6600CI review concerns. We address the issue of SMPS hash and interference spikes on p. 32, here. That issue aside, Autosat advises, "*Your concerns that our receivers have European and Asian - Pacific satellites in the factory memory will be corrected; in the future, only Asia - Pacific birds will be there.*" We also commented that we found Fujian TV loading itself three times. Ming Leu advises, "*We found it only loaded two times, which is like most other receivers.*" OK - we accept a counting error. "*You found DW audio had a 'Ssss' crackle. We have tested the Benjamin, Comstar and LG on this service and all sound normal to us.*" Perhaps, and we will allow that DW has been making such dramatic changes to their transponder that we may have caught them at a bad moment or that German is a very difficult language (as is Portuguese) to replicate electronically. "*You also found the 'S' symbol appeared for both scrambled and non scrambled signals. This software relies upon the bit stream of the SI table; if NHK channels have this data bit in the stream for FTA channels, there is not much we can do about it even if the channels are not scrambled.*" And the matter of the Instruction Manual which, like most manuals, mixes instructions for the installer with instructions for the user creating the likelihood that consumers will be hopelessly confused by instructions they cannot possibly comprehend nor benefit from reading (see item #29, SF for August, p. 8). Ming Leu: "*Your suggestion regarding two separate instruction manuals will be implemented in the future.*" Now, will other suppliers adopt the Benjamin lead to clean up the instruction manual mess? Will we ever have IRDs that don't leak SMPS generated noise into the customer's TV set? Stay tuned.

Posting on aus.tv.pay web site. "*I recently had Austar installed. The installers arrived and promptly drilled a hole for the cable in the wrong place. So they made a second hole. Then the guy on the roof was working without a safety harness. He slipped and came through my roof. Austar states they will fix the damage (as they are legally obliged to do). At the end of the (long) day, the TV pictures are great and so are the stars as I look through the gaping hole in my roof and ceiling to gaze at the night sky.*"

Humax IRCI 5400 is latest IRD with embedded Irdeco, 1 card slot and pair of CI slots. First reports say it works very well on Aurora, actually will work on (SCPC) bouquets with no transmitted PAT (such as Imparja's B1 Hz 12.364 service with Sr 5.424 and 3/4). One report says that if you enter a known Sr, it will do an auto search of transponders. Two sources in this issue.

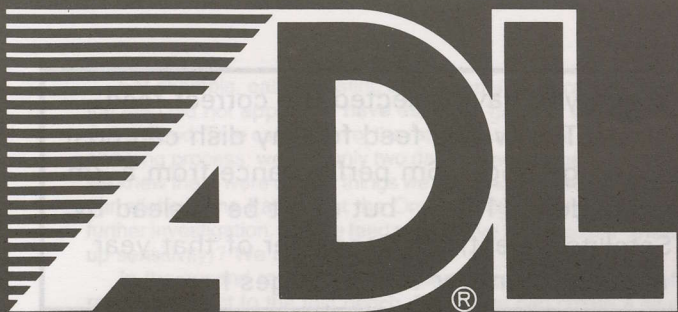
AsiaSat 4, to replace AsiaSat 1 at 122E is now scheduled for launch "during second half of 2002." The Hughes HS601HP bird will provide 28 C and 20 Ku band transponders.

Fibre optic link failure. CMT's PAS-8 service experienced significant problems (including shutting down totally) last week in September, blamed on a severed fibre optic link into Napa (California) uplink.

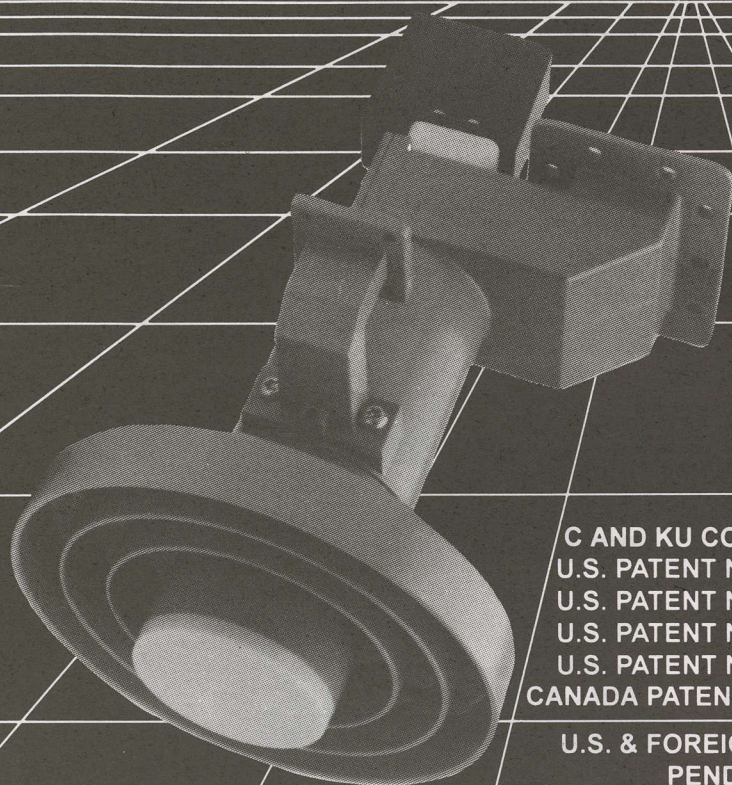
Asia Plus is new AsiaSat 3 3640 Hz FTA analogue service originating from within China, using programmes created throughout country to provide "homogenised view" of activities and entertainment.

Foxtel's cable service is using channels 42 - 50 simulcasting 9 analogue channels from lower in their spectrum - claiming "system interference." Move also could prevent them from carrying additional non-Foxtel channels as court recently ruled.

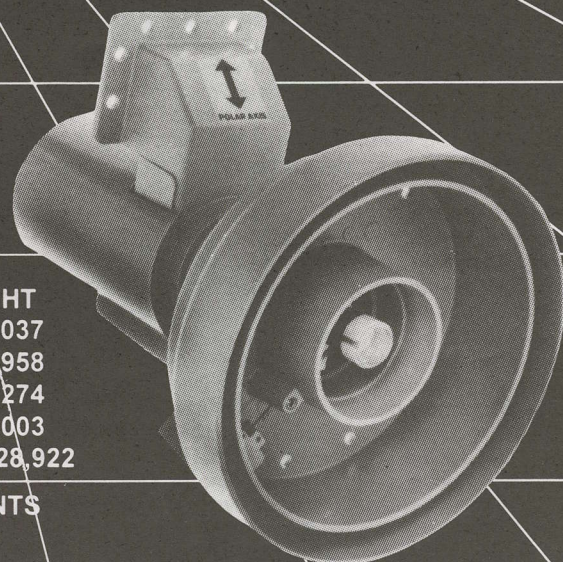
"Learning Channel," very popular Discovery like service in USA, apparently headed to Australia and Foxtel.



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**RP3-CKU/ International
Adjustable Scalar Ring Feed
with Extended C Band**

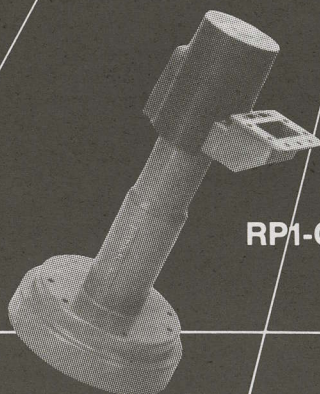


RPI-CKU Feed

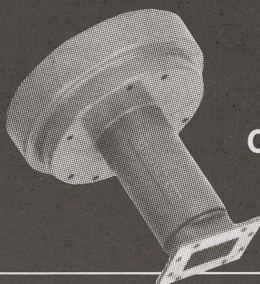
**C AND KU CO-BORSIGHT
U.S. PATENT NO. 4,903,037
U.S. PATENT NO. 5,066,958
U.S. PATENT NO. 5,107,274
U.S. PATENT NO. 5,255,003
CANADA PATENT NO. 1,328,922**

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Antenna feeds: Top dish performance only occurs when you have selected the correct feed antenna for the particular geometry of the dish to be used. The wrong feed for any dish can cost you 1, 2 - as many as 5 dB in "lost" signal. That is akin to getting 1.6m performance from a 3m reflector (dish). This two-part report focuses upon testing done (1983 - but don't be misled by the 'age' of the data) as published in CSD (Coop's Satellite Digest) for December of that year.

Updating footnotes - where required - appear at the bottom (or top) of pages here.

ON THE SAN DIEGO TEST RANGE

THE Nitty Gritty

Early in October, following up on our prior visit to the **Microwave Specialty Corporation** test range in San Diego (see CSD; October, November 1983), we returned with an expanded group of people and several suitcases filled with representative feeds from the (home) TVRO industry. We had arranged with MSC to allow a series of tests on the feed devices using their range facility, engineers and technicians. Those who attended the Orlando SPACE Convention early in November had the opportunity to hear MSC's **Duane Tubbs** explain how antennas and feeds are 'calibrated' on a test range.

Joining us for the exercise was **Gary Olsen** of Recreational Sports & Imports of Idaho Falls, Idaho (a TVRO distribution firm), **Doug Dehnert** of United Satellite Systems (a supplier of TVRO electronics and antennas) and **Tom Harrington** of Coax Seal and Universal Electronics. The testing was scheduled to eat up two full days and we ran over at that. When we were all done, we hoped we would know more about the variations in the available feeds offered to the TVRO industry, why those variations occurred, and how the dealer could translate this information into a more intelligent 'selection process' when evaluating feeds offered to him.

Coincidental with the feed testing, there were some things happening in the feed marketplace. As we shall see next month, **Chaparral Communications** was in the process of being granted a patent for their Polarotor feed system as well as a 'graphic' or 'art' design patent for their 'Super Feed' system. Thus the testing aside, the marketing forces at work here were headed for some potentially dramatic changes in the coming months.

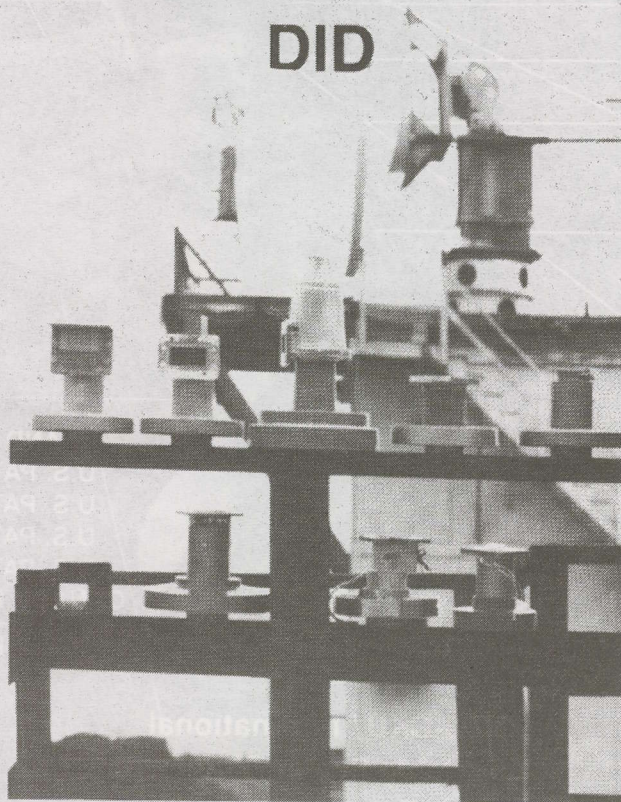
Only a handful of people knew in advance of our San Diego feed testing that we were (1) **selecting** feeds for evaluation, and, (2) **taking** those feeds to MSC to be tested. We went into the open marketplace and obtained approximately a dozen feeds through various distributors and off of people's shelves. With the exception of some new Boman units which we borrowed directly from the factory (they didn't ask why we wanted them; we didn't offer to explain), all of the units simply came out of the industry through normal channels.

Additionally, we hauled a Chaparral Polarotor device from the Turks and Caicos Islands, carefully removing it from active service just before heading for San Diego. Our objective here was to take a weather-beaten, salt-corrosion exposed feed system to the test range so that we could evaluate its performance against a brand new identical unit fresh from a factory carton. All of the ingredients for meaningful testing seemed to be at hand.

As you will see, when you are evaluating ten different feeds in each of the two polarizations at three different (spot) frequencies each through the 3.7 to 4.2 GHz band, you spend a great deal of time setting up the range and the measurement and recording equipment for each test. We first ran all of the feeds on the 'short' test range, a relatively close spaced system with the transmitter source on one side of an alleyway and the receiving and measurement point on the opposite side of the alleyway. There we did the following with all of the feeds:

- 1) Measured the 'response pattern' of the feed at 3.7, 3.95 and 4.2 GHz on one polarization (i.e. vertical); and then
- 2) Repeated the test on the same three frequencies using the

WHAT THE 'FEEDS' DID



SOLDIERS IN A ROW/ a selection of TVRO (home) system feeds line up waiting their turn to be range tested and evaluated at the Microwave Specialty Corporation San Diego test facility. In the background, a five meter reflector surface is being outfitted with a feed for test.

opposite polarization.

That's a total of six measurements per feed. The source transmitter is located some 20 feet above ground and it is connected to a broadband 'standard microwave horn' transmitting antenna. The signal is radiated through the air to a test stand also some 20 feet above ground. The test stand is equipped with a rotating turntable and the feed is clamped to that table. A motor drive on the table allows the operator to rotate the feed in a circle around its own center for 360 degrees. While the feed is rotating, the receiver connected to the feed is measuring the strength of the signal coming from the transmitter source. This received signal strength is drawn out on a moving piece of graph paper which has been calibrated in dBs or parts of dBs. So you end up with a 'pattern' for the feed which is calibrated two ways; in dBs of signal level, and, in degrees. The degree part tells you how 'wide' the feed's view is, just how well it 'sees' and therefore captures energy from the dish antenna it points at in a standard installation.

The signal plot on the graph paper, as explained in the October and November issues of CSD, is your permanent, written record of the performance of the (feed) antenna. You can study that written record and learn a great deal about the feed. That's what we intend to do here.

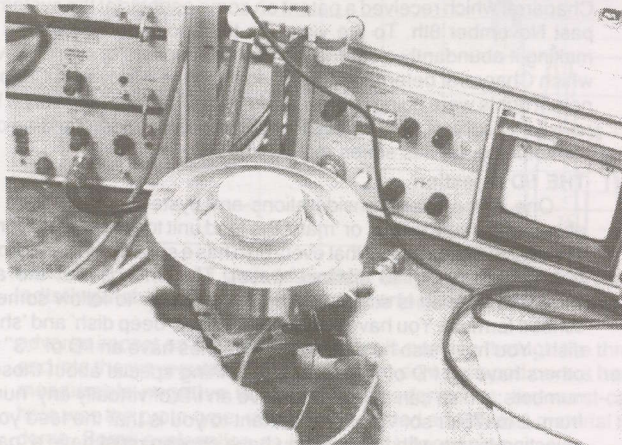
Having tested the feeds individually on the test range, for pattern and relative (but not calibrated) 'gain,' the next step was to analyze the results. With the guidance of skilled microwave antenna engineers at MSC, we tried to understand what the graphs were telling us. Most of the feeds fit the same 'mold' if indeed not the same pattern. But there were a couple which fell out of the 'mold' and we wanted to know why. So a second round of more selective testing began.

For example, pattern testing on the Omni-Spectra feed indicated the feed did not **appear to have** as much 'gain' as say a Chaparral Super Feed. True calibration of the range for absolute gain is a painful and long process; we had only two days of range time 'reserved' and we knew there were certain things we could not do and still be done in our allotted time frame. Yet the Omni-Spectra feed results begged further investigation. Did the feed **really** have less gain (i.e. lower pick up sensitivity)? We needed to find out.

In the second round of more selective testing we came off the range and went to the test bench. There you can create a situation using a microwave signal source which will allow you to test the 'match' of the feed; VSWR for the technical types. What is that all about and why is that important?

Any device that intercepts or carries microwave signals has a 'characteristic impedance.' That's a term which describes the complex 'resistance' of the circuit or device. Suffice to say that when you have two different gadgets that plug or attach together, and you are transferring microwave energy from one of the gadgets to another gadget (such as a feed output to an LNA input) the 'impedance' of the two must be as close to identical as possible, or, some of the energy in the upstream device will be lost when it transfers to the downstream device.

To put that into the feed and LNA world, if the feed is properly designed and captures 100 units of energy, but in 'sending' that energy from the feed's throat through the flange on the rear of the feed to the mating (input) flange on the LNA, there is an 'impedance mis-match,' not all 100 units of microwave energy get into the LNA. If, for example, 80 of the units got into the LNA, we would have lost 20 units in the 'transition' or 'transmission' from the feed to the LNA. Not good.



OMNI-SPECTRA MATCH and loss test; checking the power that 'comes back' to analyze the feed's loss characteristics.

Using work bench signal generators and microwave 'bridge' devices connected to the appropriate microwave receiving equipment which is in turn connected to the appropriate chart printers, you can 'see' on paper just what the impedance function of the feed does to that transfer of energy. We did this, first with a Chaparral Super Feed since that seemed like a suitable reference, and then with several additional feeds (including the Omni-Spectra unit). Now we had a **second way** of looking at the performance of the feed, from a different direction as it were.

Finally, there would be the 'long range' testing; of the original ten feeds, three would be selected from the pile and individually installed on a 5 meter high quality parabolic dish antenna using the 7,700' range described in the October issue of **CSD**. Now we would be measuring the actual performance of the feeds in the real world (i.e. reflector plus feed) to determine how well the feeds functioned when they were put into an operating condition. And for these three feeds, we would have a 'third perspective' to study.

Setting aside test runs for 'range verification' (i.e. assuring

ourselves the equipment and range were operating properly), when we got finished we would have more than 80 separate paper graphs to evaluate from the short and long range tests, and another ten or so from the bench tests. It would be enough to fill a book! But, we should know enough about feeds at that point to give you the support guidance **you need** in making your own feed evaluations and purchase selections.

DIVIDED In Parts

Because of the tremendous amount of data collected, and the reams of material to analyze and digest, not all of this report can appear in a single issue of **CSD**. In fact, it will take three issues to properly report to you what we found and how we interpret the results. And, in the interest of fairness to all of the feed suppliers involved, we will withhold **direct comparison data** on the various feeds **until** the third and final part of this report-series.

The fact that we were in San Diego, making tests of feeds, may not have been widely known **before** we went to MSC, but within days of the testing it seemed like hundreds knew about it. It is sometimes difficult to keep such things 'quiet.' And, not all of the feeds did well in the tests. We have already mentioned one of the areas that bothered us, involving an Omni-Spectra feed. Just to be sure that nobody tries to jump the gun and determine without the facts that the Omni feed did poorly, let us restate that direct comparisons between feeds will await our third and final part in this series. Where we found 'inconsistent' results (i.e. **our tests** did not produce results which favorably compare with the original manufacturer's claims or data sheets for the products) we have subsequently gone back to the suppliers to ask their interpretation of our results. This is having the effect of extending the time frame involved with this study since scheduling secondary visits to



HOW DO I HOOK THIS thing up? Coop pondering 'detailed instructions' provided with feed being tested.

various feed production facilities so that we can discuss our results with the appropriate engineers first hand adds additional time to the process. It will all sort out in the end.

HISTORY Of Switched Feeds

Those who have been around the (home) TVRO industry for some period of time are aware that until the mid-summer of 1981, this industry had a quite unusual way of switching customer receivers from one polarization (such as vertical) to the other. We installed a small television antenna rotator device (such as the Alliance model U-100) at the feed point, connected to the junction of the tripod or quadpod legs, and we then installed the LNA plus the feed itself on that rotator's rotating tube or rod. When the customer wanted to switch from WTBS to ESPN, he turned a dial on his television antenna rotator and the motor on the feed rotated the feed and the LNA on its axis. Slow, noisy, subject to mechanical maintenance problems, and not very satisfactory. Still, it worked and some of the early receiver designs such as the original **'Washburn Receiver'** (now Earth Terminals) actually pro-

Feed "gain" measurements. In fact, a feed does not have "gain" in the traditional sense of antennas. A feed is a "dipole" (probe) plus a focusing system (the inner walls of the waveguide - similar to a set of "directors" in a terrestrial yagi antenna). A feed "loses" or "gains" performance because it does not properly "illuminate" the reflector surface, and/or because it has significant sidelobe degradation and poor impedance match.

Polarity "rotation" or selection was an important consideration when satellites grew from 12 channel single polarity C-band to 24 channel (accomplished by utilising the same frequency spectrum two times - once, each, for vertical and horizontal). Effortless, instantaneous switching between polarities became an engineering challenge and several solutions were offered. Each solution offered patent possibilities, and the stakes for creating a winning design that would become the "standard" were high.

vided an optional switching system with the receiver so that the TV antenna rotator moved semi-automatically when the customer changed receiver channels.

At the first industry trade show held in Omaha, Nebraska, there appeared in the booths a pair of devices which would forever change the way feed systems would function. **Bob Luly** demonstrated a motionless 'ferrite' rotational system while **Antenna Technology Corporation** in Florida demonstrated a system which bore a striking resemblance to a later device brought out by Chaparral Communications. Luly went into production with his 'ferrite rotator' while ATC did not. It would be another six months or more before the Chaparral Polarotor would appear in the market and finally capture the feed market.

Making a microwave signal do strange things inside of a section of 'waveguide' (a feed is actually nothing more than a section of 'waveguide transmission line' open at one end to allow the signals to get in) is not, it turns out, all that 'new.' In fact, a fellow named Murphy back in 1952 made an application with the U.S. Patent Office for a device he called an 'Amplitude Modulator' (for microwaves). In March of 1959, nearly seven years after filing that patent application, Murphy's device was granted a patent (U.S. Patent Number 2,880,399) and the first 'polarization switching' system to select polarized microwave signals within a waveguide was off and running.

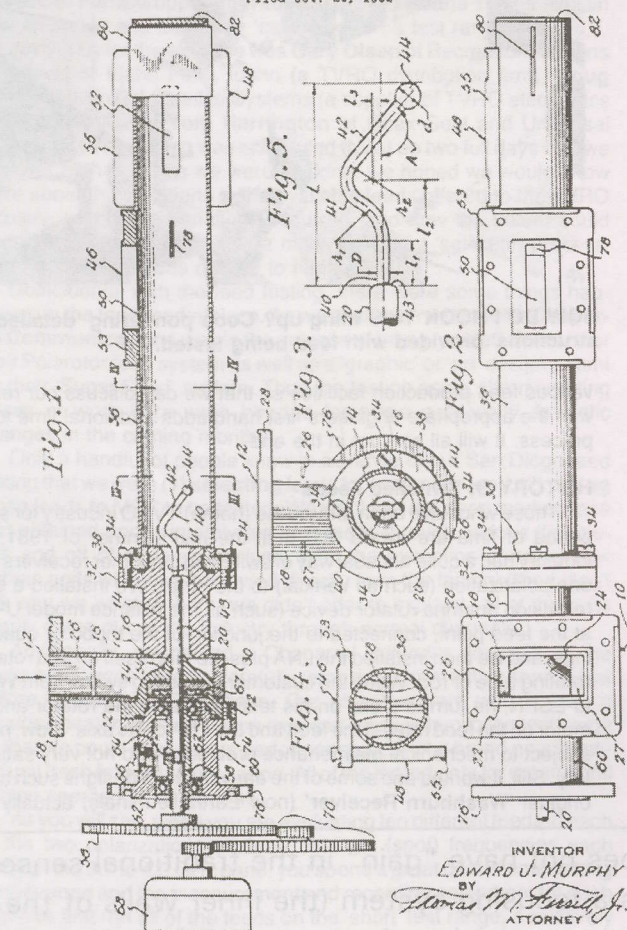
March 31, 1959

E. J. MURPHY

2,880,399

AMPLITUDE MODULATOR FOR MICROWAVES

Filed Oct. 20, 1952



INVENTOR
E. J. MURPHY
BY
Thomas M. Farrell Jr.
ATTORNEY

MURPHY'S MODULATOR / patented in 1959, it created the first technology for 'switching' inside of an open waveguide system to create selectable polarization for microwave energy signals.

Murphy had never heard of Clarke orbit satellites when he created his device. He had no interest in separating ESPN from WTBS because they did not exist at the time. But he did lay the foundation for what would later become some 'prior art' technology. He was, simply said, 'ahead of his time' and the market for what he had in 1952(59) was hardly substantial.

More recently, in the period from the Omaha debut of polarization switching systems until the present, there has been some confusion concerning where the 'use rights' might lay for the basic system. Bob Luly's ferrite rotational system was someplace between new 'art' or technology, and, a refinement of an older technology using newly available materials. Patent rights, if any, did not seem to be an important consideration.

The mechanical rotation system exemplified by the Chaparral Polarotor was less complicated as 'high tech' art but possibly more ingenious because it broke new ground. There was a period of time where the claim to 'first creator' was in dispute. **Gene Augustin** of Antenna Technology Corporation **showed it first**, in Omaha to the (home) TVRO industry and possibly even earlier than that at a cable show in Texas in February of 1981. But it was Chaparral which brought out the first version to be (widely) marketed and it was Chaparral which received a patent on some aspects of the system this past November 8th. To the victor go the spoils and Chaparral was making it abundantly clear that any other suppliers of similar devices which Chaparral determined were violating the newly won Chaparral patent rights were going to be hearing from Chaparral attorneys. We'll revisit that subject, as it relates to a better dealer understanding of the marketplace, as this series moves ahead.

THE f/D Question

One of the basic considerations any system creator must think about is how you 'match' or 'mate' the feed unit to the reflector surface. The consideration here is that every dish has a specific, designed for and built-in focal length to distance (ratio). That means that the actual 'curve' of the dish is sculptured by the designer to follow some prescribed formula. You have heard the phrases 'deep dish' and 'shallow dish.' You have also heard that some dishes have an f/D of ".3" while others have an f/D of ".4". There is nothing special about those two numbers; a dish can be made to have an f/D of virtually any 'number' from .2 to .75 or so. What is important to you is that the feed you are selecting to use with the dish you have chosen must have a 'pattern' which coincides with the f/D of the dish. It would not be appropriate to use a feed designed to function (best) with a .3 f/D dish on a dish which has an f/D of .4. Just like the 'impedance match' problem discussed early, there is a 'loss' in the system when the two sub-parts of the antenna do not 'mate' to work together at maximum efficiency.

The designed-for f/D of a feed does not affect the short range (feed-stand-alone) testing procedure of a feed. All of the tests of the feeds alone are performed in the same manner. This is important to the understanding of the specific tests that follow.

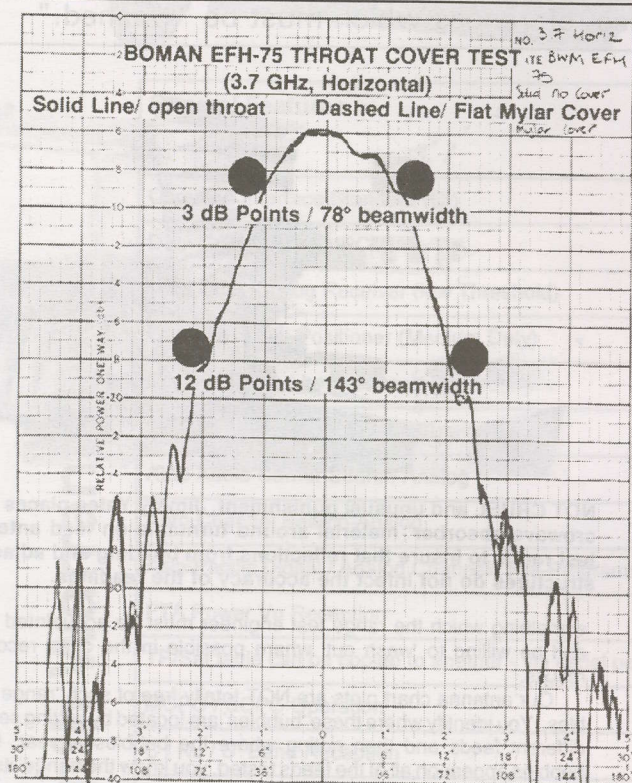
SUB-TEST — Plastic Covers

At the time of the feed tests, **Boman Industries** was in the process of evaluating a different type of plastic cover for their feeds. Most of the feeds now available offer a plastic cap which is installed in the open end of the 'waveguide' to keep unwanted moisture, animals and dust/dirt out of the feed itself. Different firms approach the 'weather cap' with different types of material, and with differing cap designs. We decided to see what the effects were when three different types of cap were installed on a Boman EFH-75 feed.

As the chart recorder **graph here shows**, first we took the cap totally off and measured the performance of the feed with no cap. That would be the **ideal** situation since **any cap of any type** will have **some** (adverse) effect on the performance of the feed system. It simply becomes a matter of designing the cap so that the adverse effects are minimized. Then we repeated the tests using a flat piece of mylar (plastic) created for the test by Tom Harrington, and followed this with a pair of additional tests using a dome shaped throat cover; the same cover which Boman was shipping with their feeds, and, with a newly created proto-type dome shaped cover which had a more pronounced 'dome' shape and thicker styrene plastic.

The charts, with explanation, pretty much tell the story. A flat piece of mylar, pressed into test service by Harrington, had the smallest

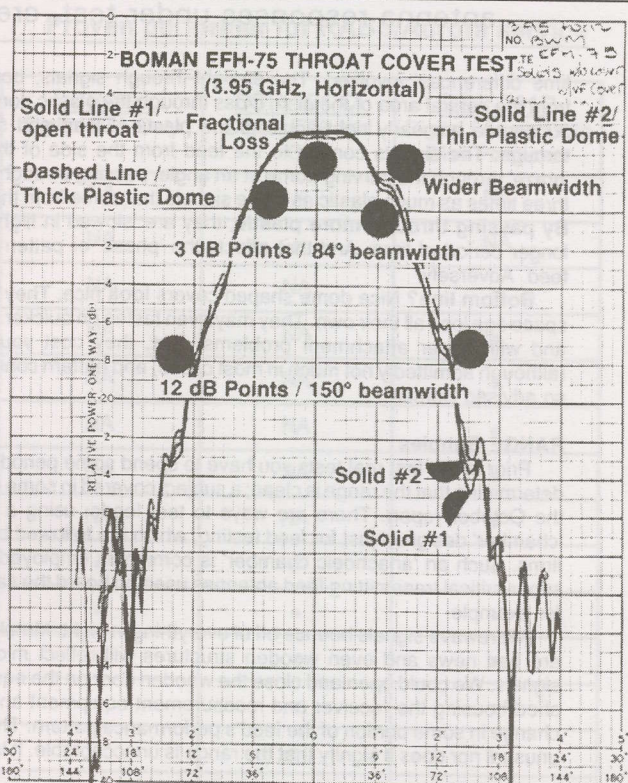
Microwaves are "funny" waves. They don't always do what theory predicts. The size and shape of the "throat" is a straight forward calculation. But insert ("stick") something foreign into the throat - such as a rotating feed mechanism, or, try to protect the open-to-the-elements throat with a cover - all the rules change. Adapting the necessary changes into the straight forward and simplistic waveguide "throat" plus fixed stub pickup antenna at the rear of the throat was a microwave challenge created by C-band TVRO.



LOSS INTO THROAT caused by thin, flat plastic cover is virtually indistinguishable from open throat performance of feed system.

adverse impact on the microwave signals passing through the throat and into the waveguide. **Either** of the two dome shaped covers had a **measurable negative impact** on the performance; the worst-case here was the proto-type, more highly domed and thicker-material test dome. Some explanation as to what was happening.

Any cover over the throat of the feed waveguide will 'slow down' the through-passage of the microwave signals. Microwave signals travel at the speed of light in air, give or take a few percentage points. Microwave signals travel far more slowly in cable, for example; perhaps as much as 80% as fast in RG-213 cable as in air. If you could coil up enough very small cable, and not lose the signal totally because of signal attenuation, you could come close to actually stopping the microwave signal in its tracks!



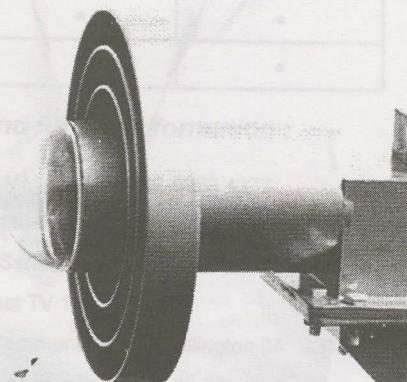
WHILE CHANGES ARE small, there is a measurable reduction in feed efficiency with the thick styrene cover resulting in slightly increased beamwidth.

A piece of plastic, no matter what its shape, momentarily slows down the signal. The 'velocity of propagation' of the microwave signals traveling through the plastic is slower than the velocity of propagation through the air. As long as all parts of the microwave signals entering the throat of the feed encounter the same plastic shape and thickness at the same time, they pass through with minimal disruption.

However, when the cover is dome shaped and some of the signal bouncing off the reflector surface hits the dome straight on from the front while other portions of signal come through the dome at a 'grazing angle' that appears tangent to the dome, there are 'minute



HARRINGTON CREATED FLAT SURFACE throat protector. Lowest losses of all.



BOMAN EFH-75 FEED with thicker plastic throat cover. Objectionable losses.

Hard-number-tests conducted at microwave frequencies require specially built and carefully maintained "test ranges." This is ideally several kilometres in length - between the "transmitting" site and the "receiving" end - with good elevations on both ends, a dip (lower than the two ends in height) in the middle. All of this is to eliminate reflections from anything that might create unwanted, false "secondary" paths arriving at the receive site from some source other than the transmitter. Secondary paths ("reflections") alter the true antenna responses under test, create false references which must be "washed."

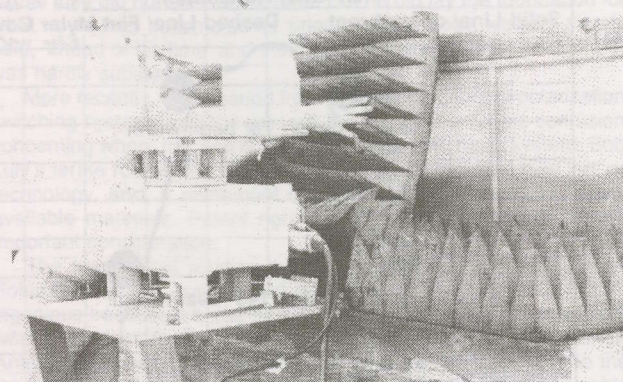
time differences' involved. The straight-through signals, bouncing from the central area of the dish, cross through the plastic dome at a 90 degree or nearly right angle to the plastic. Clean and straight through. The signals coming to the feed from the side of the dish 'graze' through the curving dome at an angle, passing through two or three times as much plastic as those signals that come from the front. **By passing through more plastic**, they are 'slowed in flight' for a longer period of time. And that affects the 'phase' or pattern of the feed. Adversely.

Bottom line? Nice dome shaped covers look nice. They have a space age look all their own. They may even fasten on quicker, better, and with fewer attachment problems. **But**, they cost you signal (although admittedly not much in most cases) and pattern control. We so advised Boman.

RANGE Bubbles

Prior to the first real tests you have to spend some period of time determining that the range is clean; a subject covered in some detail in the October report. There are ways to test feeds, using a special 'chamber' designed just for feed testing, which are followed by many firms. Such an 'anachoeic chamber' is commonly employed for the super-critical transmitting feed antennas used on board the satellites, for example.

Microwave signals bounce off of everything in sight. Metal objects are bad news and even wooden structures will reflect microwave signals. We could open and close the wooden door on the equipment shed housing the receiver and measurement equipment and see a change in some portion of the feed's performance pattern. This is not unusual nor does it signify that the range is unacceptable. It is simply



NOT CRUEL and unusual punishment. Jimmy Yates places 'microwave absorber' material around turntable on feed antenna test range to insure that reflections from building and adjacent structures do not infect the accuracy of the readings.

something which the range test engineer must be acquainted with, and be willing to 'wash out' where possible in the chart recorded results.

Our antenna chart plots are NOT totally free of such 'range bubbles.' You identify where these 'bubbles' are located by testing several different feeds and then noting where the bubbles appear. If the bubbles appear on all of the feeds tested, you know the 'range' itself is causing the bubbles. If they appear in the same spot only on one or two feeds, you know the feed itself is at fault (or, somebody forgot to leave the door open or closed on the shed!).

As the photo here shows, one of the ways you attempt to control reflections is to build a bed of 'microwave absorbing material' around the test stand. Microwave signals that strike this funny mid-evil formed material stops dead and is 'absorbed.' That keeps the signals from bouncing off say the test shed behind the test stand, and reflecting back into the feed as the feed rotates around with the motor drive. To completely eliminate **all** of the bubbles in a range such as we were using would require a 'football field' covering amount of microwave absorber and a crew of people to move a piece about at a time to totally 'clean' the range of all bubbles. What you do in a practical world is identify those wooden and metal (etc.) objects close by that are having the most pronounced and damaging impact on the tests, and cover them with absorbing material. Then you 'wash out' the rest knowing that you can spot them on the charts and easily discount them if they prove troublesome in the chart analysis.

WEATHERING/ Chaparral Polarotor

We first raised the question of feed weathering in serious context in our **April 1983** issue of **CSD**. We had observed and readers had reported a considerable cosmetic degradation of the aluminum Chaparral Super Feed and Polarotor 'scalar rings' with time. In our island test and system facility in the Caribbean, the apparent cause of the cosmetic degradation was obvious; high salt content in the air resulting in oxidation of the bare aluminum finish. Similar tests with Boman feeds, protected with an epoxy finish, indicated no cosmetic degradation with time. Our concern was less with the change in **appearance** than with what we perceived might also be a **change in performance**. The oxidation was not limited to the scalar structure of the feed but also appeared inside of the feed 'throat' proper. Since the microwave energy travels routinely down the inner walls of the throat, it was possible in our mind that in time the performance of the feed might degrade as a result.

Now there is no 'perfect' way to judge the performance of the feed "before" and after weathering. Ideally, you would first test the feed on the range and then take that feed into the environment and let it oxidize. Then you would bring it back and re-check it. We did not do this since access to the range has been a recent event. So we did the



IT MIGHT GET WET. Tom Harrington (left) and USS's Doug Dehner ponder what could happen if moisture or bugs found their way into the feed throat on this popular feed.

Satcruiser Digital Satellite Receivers



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IRDETO CAMS available to suit

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(Authorized smart card required)

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12 Month Warranty

General Features	<u>DSR-101</u> Digital FTA Only	<u>DSR-101 CI</u> Digital FTA and CI	<u>DSR-201P</u> Digital / Analog with Dish Positioner
Common Interface Standard (CI)	NA	•	NA
Dual CAM Sockets (PCMCIA)	NA	•	NA
Dual input Analog Receiver (low Threshold)	NA	NA	•
On board Dish Positioner (Medium Duty)	NA	NA	•
Motorized Feed horn Support (Polorotor)	NA	NA	•
32 Step Threshold Extension-Analog	NA	NA	•
Auto Audio Carrier Search-Analog	NA	NA	•
Auto Channel Search-Analog	NA	NA	•
Asia/Pacific Digital / Analog Channels Pre-Programmed	•	•	•
FTA Power Vu Reception	•	•	•
TP/Sat table can be copied to another - via serial port	•	•	•
MCPC / SCPC Operation	•	•	•
C / Ku / S Band Reception	•	•	•
Auto PID Detection and manual PID entry	•	•	•
Universal LNB Support	•	•	•
DiSeqC / 22KHz / 0-12 volt LNB switching modes	•	•	•
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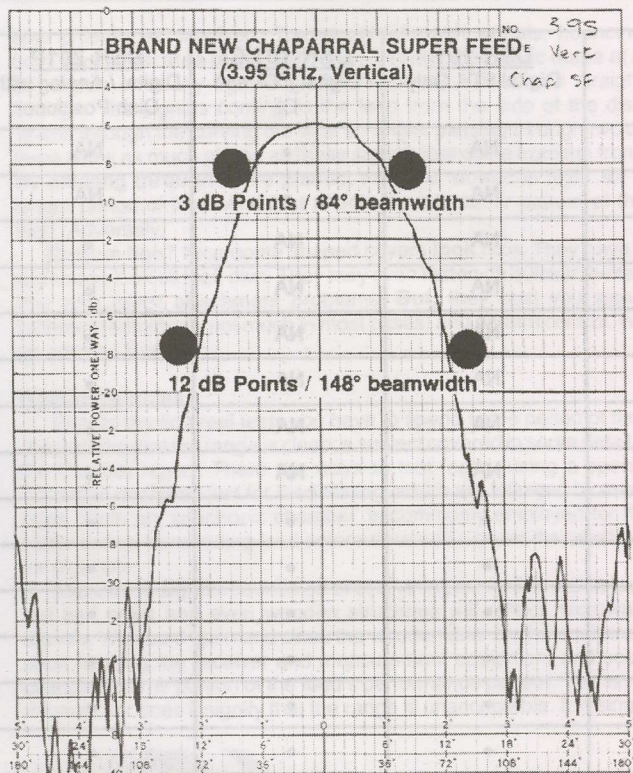
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NZ Telsat-Palmerston North 06-356 2749

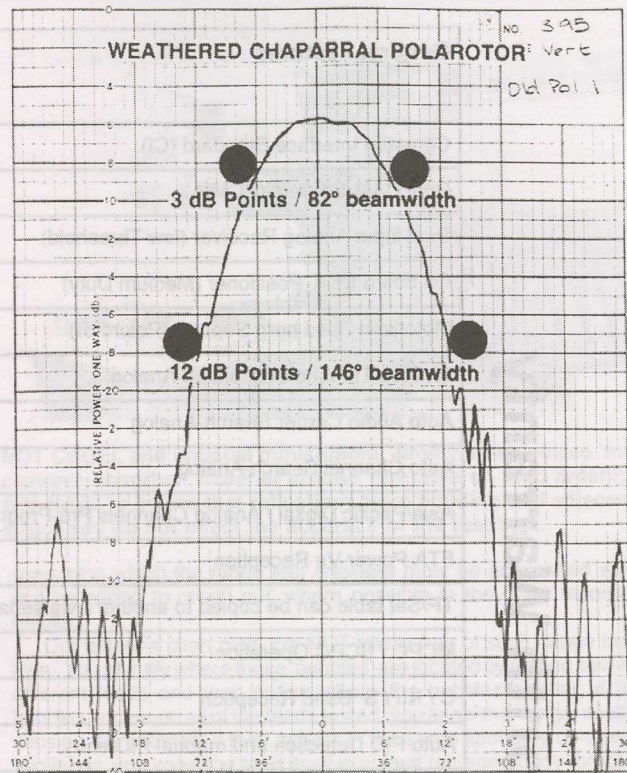
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Oxidation of a feed - especially Chaparral models which did not have a powder or other protective coating - has always been controversial. If the feed's original smooth surfaces turn into ugly pitted surfaces, what happens to the performance? Surprise: Nothing. The "width" of the feed response (below, 84 and 82 degrees) is the most crucial element of the performance. The "width" of the 3 dB and 12 dB points determines how effective the outer portions of the dish are - there is a correct width for each antenna f/D.



BROAD NOSED pattern of Super Feed is typical of loading effects caused by Scalar rings.



DECREASE IN PERFORMANCE (pattern) caused by weathering is not measurable.

next best thing; we compared a brand new Chaparral product with the older, weathered feed. We expected to find minute differences in feed performance since even two, identical, brand new feeds would exhibit those types of differences. What we were looking for was dramatic difference between the two feeds.

Publication of all six graphs for both feeds, here, would be a pointless mis-use of the available space. Two are presented, one that is representative of both feeds as tested at MSC.

What we found is this. The patterns are not identical. In comparing the six sets of patterns (two for each frequency, 3.7, 3.95 and 4.2 GHz) for the pair of antennas, we found no consistent pattern deviations. Individual 3.95 GHz patterns for the two antennas are not identical; but there are no overt differences. This becomes especially true when you average or 'integrate' all six patterns for each of the two antennas and prepare a master 'composite' pattern for each of the two antennas.

This leads us to the conclusion that while six to 12 months of hard weathering and surface oxidation may look ugly, there is not any proof here that the performance suffers. Perhaps, in a longer test period, there would be degradation of the feed's performance. But we found none in our comparison tests and as noted, since we initially raised the issue in print in the April CSD, we wanted to clear that up here.

THE Scalar Feed

The primary purpose of the scalar rings is to equalize the 'pattern' or response of the open-mouth waveguide 'throat' over both planes of signal activity. The 'original' feed was simply an open-mouthed piece of waveguide. This was followed by a 'flared horn' which opened up the waveguide throat by giving it a bigger 'mouth' to capture the signals. Finally, along came the scalar 'loading plate,' a circular shaped attachment that fit over the waveguide throat surrounding it at the throat opening with concentric circles of metal (or metalized material) attached to a flat plate.

Early Chaparral Super Feed units manufactured the basic throat waveguide plus mounting flange in one casting operation, and then

manufactured the scalar concentric ring 'load' in a separate manufacturing operation. You mated the two together, sliding the scalar concentric ring(s) over the throat, tightening Allen 'set screws.' In that era, the installer could 'slide' the scalar ring up and down the throat and observe the impact of the ring on the throat. You were able to test the basic throat/flange alone, and then check the combination with the scalar at various in and out adjustment points. Chaparral soon made the full feed with a single casting and that eliminated the possibility that you might mis-locate the ring's location by fooling around with the adjustment and getting it in the wrong spot.

One of the feeds tested still followed this approach, separating the basic throat system from the scalar 'loading ring.' Naturally we wanted to see what might happen if we played with that adjustment. Tom Harrington was made responsible for this 'sub-test' within the testing program and this is what he found.

The feed in question is the Polatron III unit. Note in the photograph of the unit that we have a 'two ring' scalar loading system snugly fitting onto the waveguide throat. A (white colored) weather protection plastic 'dome lid' covers the throat proper.

In the first chart selected we have the 3.7 GHz horizontal field displayed. The 3 dB (one half power) points on the feed's response curve are marked on the chart. The same measurement in the same horizontal ('E' plane) field is also shown for 4.2 GHz. **Notice that the tip or nose of the pattern does change between the low (frequency) end of the band and the high frequency end.** This is not an unusual performance observation and most of the feeds tested displayed a similar frequency effect. This simply means that there is more of the energy coming from the outer edges of the dish getting into the field on the higher channels than at the lower channels. The difference between transponder/channel 1 and 24 will, however, be in the under 1/10th dB region in most cases even though the visual display on the chart makes it seem far more dramatic than that.



PACIFIC SATELLITE



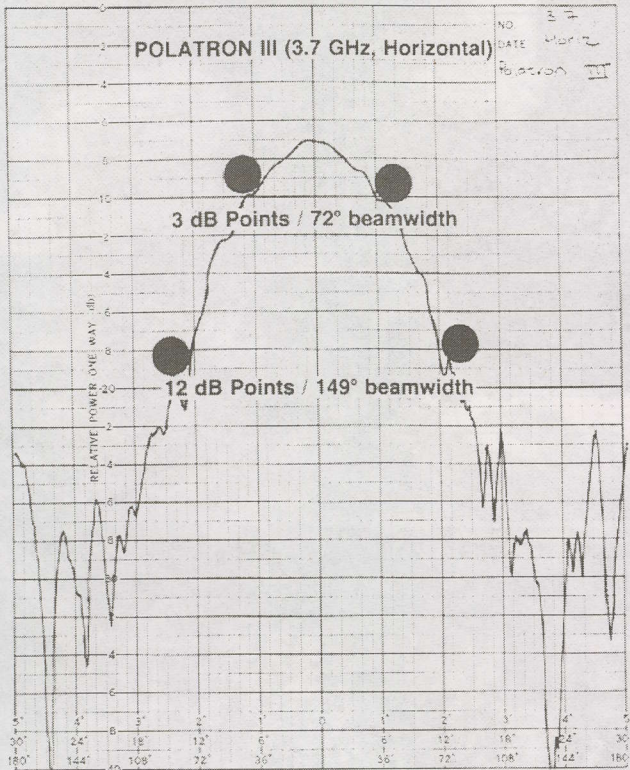
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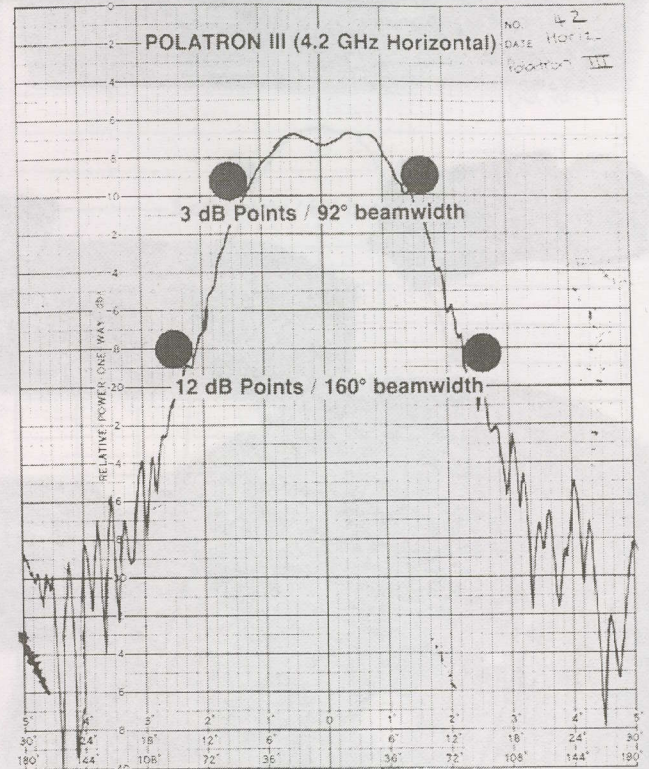
One way to "imagine" how the feed pattern relates to the parabolic dish curvature is to view the graphs below as a parabolic antenna. Find the 12 dB points and think of this as the outer edge of the dish, and the 3 dB points as almost to the centre of the dish (which is half way between the two 3 dB points). Satellite signal intercepted at the 12 dB points - the outer edge of the dish - will in fact be 12 dB weaker at the feed probe than energy reflecting from the centre of the dish - midway between the 3 dB points.



MORE ROUNDED NOSE pattern-center at 3.7 GHz (low end of 'band') typifies most of the feeds in use in (home) TVRO industry.

In the near-ideal situation the top portion of the response would be absolutely flat across the top portion (a straight line, left to right or right to left) out to the required 3 dB 'beamwidth.' Then the display would fall down the chart rapidly. There is no such 'idealized' feed available today.

The straight-across wide portion at the top would ideally correspond in degrees of feed 'vision' with the f/D of the dish. Let's say that we had a dish that required your feed to 'see' 130 degrees of total dish surface (left to right or edge to edge) **before** the feed would be looking **around the edge of the dish at the ground below**. Ideally, the feed would 'see' over a 'vision width' of 130 degrees and then it would abruptly not see anything beyond that point. In other words, the feed would 'see' just the dish surface alone but it would be 'blind' to the ground or sky around the perimeter of the dish surface.



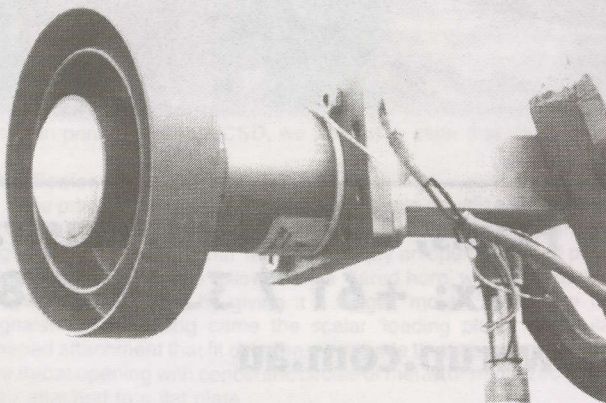
FLATTER NOSE pattern-center at 4.2 GHz (high end of 'band') typifies most of the feeds in use in (home) TVRO industry.

In the real world the feed sees best 'straight ahead,' towards the center and then it sees 'less well' as the field of view widens (in all directions: the full 360 degree circle). Various antenna system designers assign numbers to the vision process. They might wish that the feed have 10 dB less vision (i.e. less signal pick up) at the point where the vision crosses over the edge of the dish proper and starts to see the ground below. Or, they might assign a different number to that cross over point; such as 12 or 15 or 20 dB. What they are trying to balance here is the signal pick up from the dish's surface with the noise pick up from the ground that lays beyond the edges of the dish. Remember that the ground is a source of noise and if our feed 'over illuminates' the dish, and sees 'too well' beyond the dish edges or perimeter, the antenna system picks up an abundance of noise which in turn degrades the quality of our reception.

The scalar loading ring is supposed to adjust the field of vision so that the top portion or idealized flat portion spreads out, before the downward slip towards the bottom of the chart. The Polatron III scalar loading ring, since it detached on our unit, could be removed and we could observe and measure the effects of the loading ring.

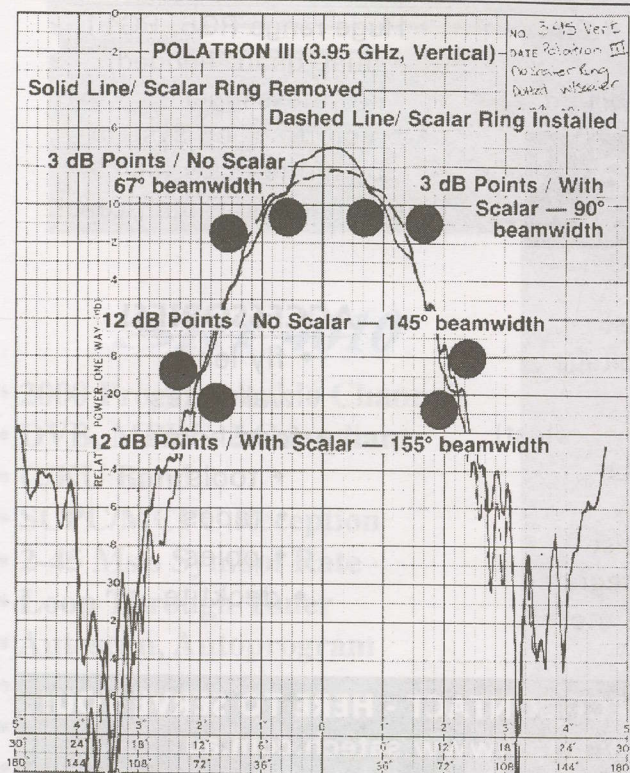
This is shown in the chart here that has a dual 'trace' on it; operating at mid-band (3.95 GHz) and in the vertically polarized ('H' field) wave form, we could see what happened when the feed was run 'stock' (dashed line) and with the scalar ring removed (solid line). A few comments about what you are studying here.

Whenever there is an antenna being measured, you have a certain, specified, and measurable total amount of signal energy present through the antenna (i.e. appearing at the 'output' of the antenna). The design of the (feed) antenna determines not so much **how much** energy you can receive but rather **where** that energy can come from. Remember that a dipole antenna, a basic reference type of antenna, receives equally well from all directions except two; those being off the 'ends' of the dipole. A piece of waveguide, open at the end in the now familiar 'throat configuration,' can collect energy from its open-front direction only. However, the 'field of view' or vision of that throat is



POLATRON FEED with scalar ring in place.

Chaparral's "Golden Ring" attachment was an innovation in 1983 - but the industry was not certain what it really did. The answer was "not much" for most antennas. However, changing from an open-throat feed to a *scalar ring* feed had a measurable (positive) impact on feed performance (below), especially for dishes with a short f/D. Now, once the technology was sorted out, and the industry understood how feed design changes affected performance, the legal battles began (in November SF).

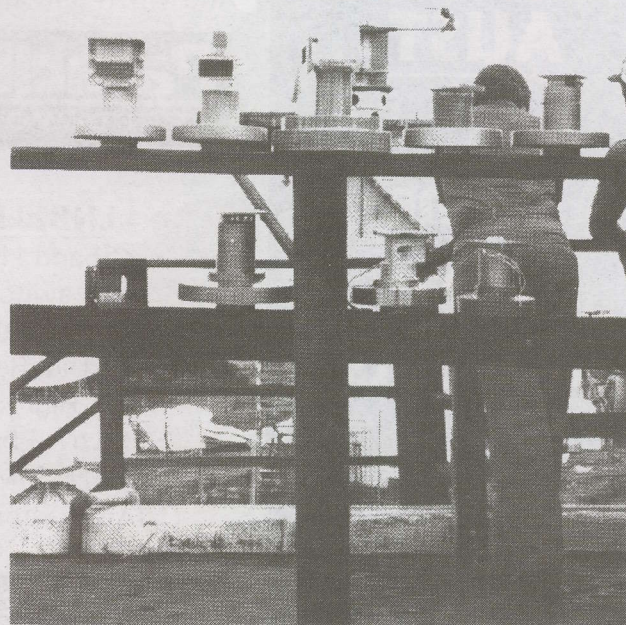


SCALAR RING (dashed line) and no ring (solid line) shows impact of 'loading' throat with scalar plate. Note text for comments about properly integrating the pattern for one-on-one comparisons and changes in 3 and 12 dB (down) beamwidths.

greatest when the 'flow of energy' is straight into the throat rather than coming to the throat from a 'side angle' (such as we have coming from the outer edges of the dish).

The scalar loading ring, properly designed and properly installed, re-focuses the vision of the throat so that it is 'spread' away from the straight-ahead forward direction and more to the sides. **We are not creating any new 'energy-capturing-capacity' with the scalar loading ring;** we are merely **re-distributing where that energy can come from** by moving some of the open throat's 'focusing powers' over to the edges of the dish.

Now look carefully at the Polatron III feed measurement showing the **with**, and, **without** scalar ring presence. The without (solid line) display is higher up the chart, indicating concentrated focusing power. But it is focused squarely in the **middle** of the chart, or at the **center** of



the dish. The dashed line, on the other hand, is a broader display; a straighter line across the top indicating that the focusing view has been 'squashed down' straight ahead in favor of **shifting** some of that focusing energy to the sides or edges of the dish.

There are two approaches to making a chart such as this. You can do your first 'cut,' say with the ring removed (solid line) and then come back without touching any of the chart recorder/receiver sensitivity controls and do it again. When you do it this way (we did), you see quite clearly that the second cut energy recording (dashed line representing the antenna with the scalar loading ring) is indeed lower in level straight ahead but broader or wider to the edges.

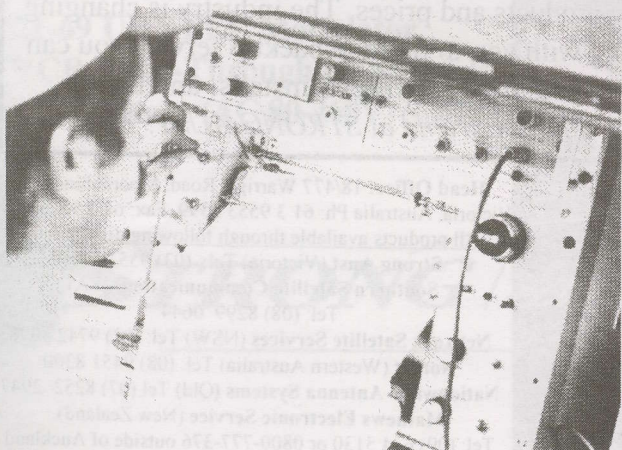
The other approach is to make your first cut recording and then when making the second cut re-adjust the sensitivity controls of the receiver/recording system so that both cuts have the same 'amplitude' (strength on the paper). This would have placed the dashed line highest point **exactly equal** towards the top of the graph paper with the highest point previously recorded with the solid line. Technically, this is known as 'integrating the patterns' or making them exactly comparable in amplitude.

The point here is that you don't really have **MORE** energy with the non-scalar-loaded horn; you simply have that energy concentrating at different points in the feed antenna's pattern. The **TOTAL** amount of energy captured does not **HAVE** to change; but where it appears on the chart (and therefore where the feed antenna 'sees' best) does change with the addition of the scalar loading device.

We did one additional test with the Polatron III ring. Since we had the feed 'apart' Harrington turned the scalar loading ring around, making a 'flat plate' face towards the signal source. The back or away-from portion of the scalar ring is more or less perfectly flat. By facing it towards the signal source we were able to measure the effects of having a non-sculptured loading device (flat rather than 'ringed'). The results (not shown in graph form here) were virtually identical to the feed with no scalar loading ring at all. In other words, the contours of the scalar loading ring do account for something and the open throat feed cannot be 'loaded' for a 'broader pattern' simply by shoving a chunk of metal down over the throat.

NEXT Month . . .

. . . we will look at the test measurement results with the Super Feed, the Boman series feeds and explore how the f/D of the dish impacts upon the design of the feed proper.



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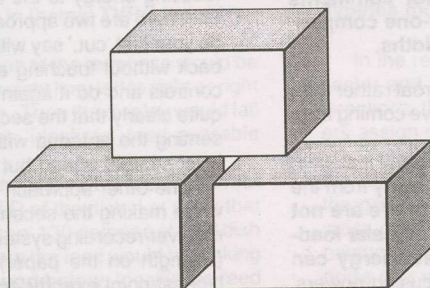
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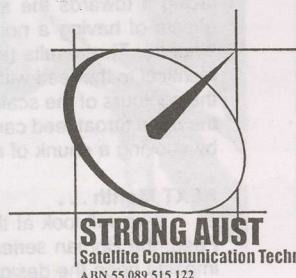


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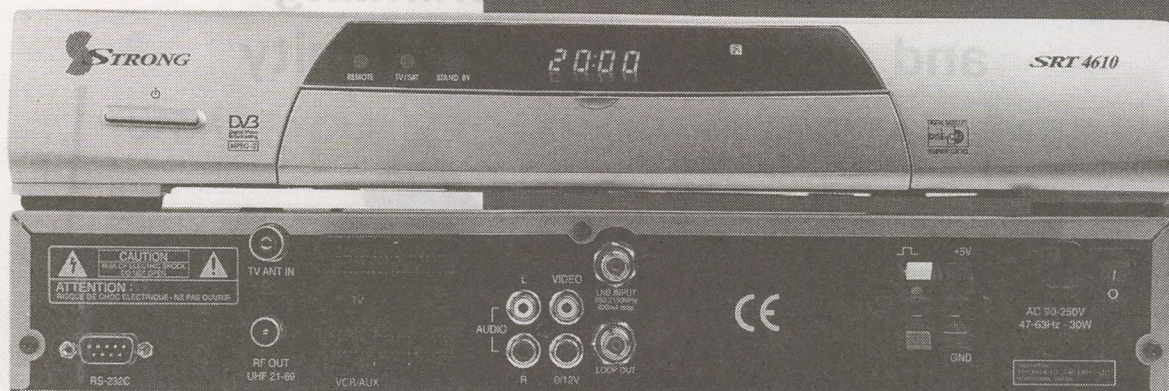
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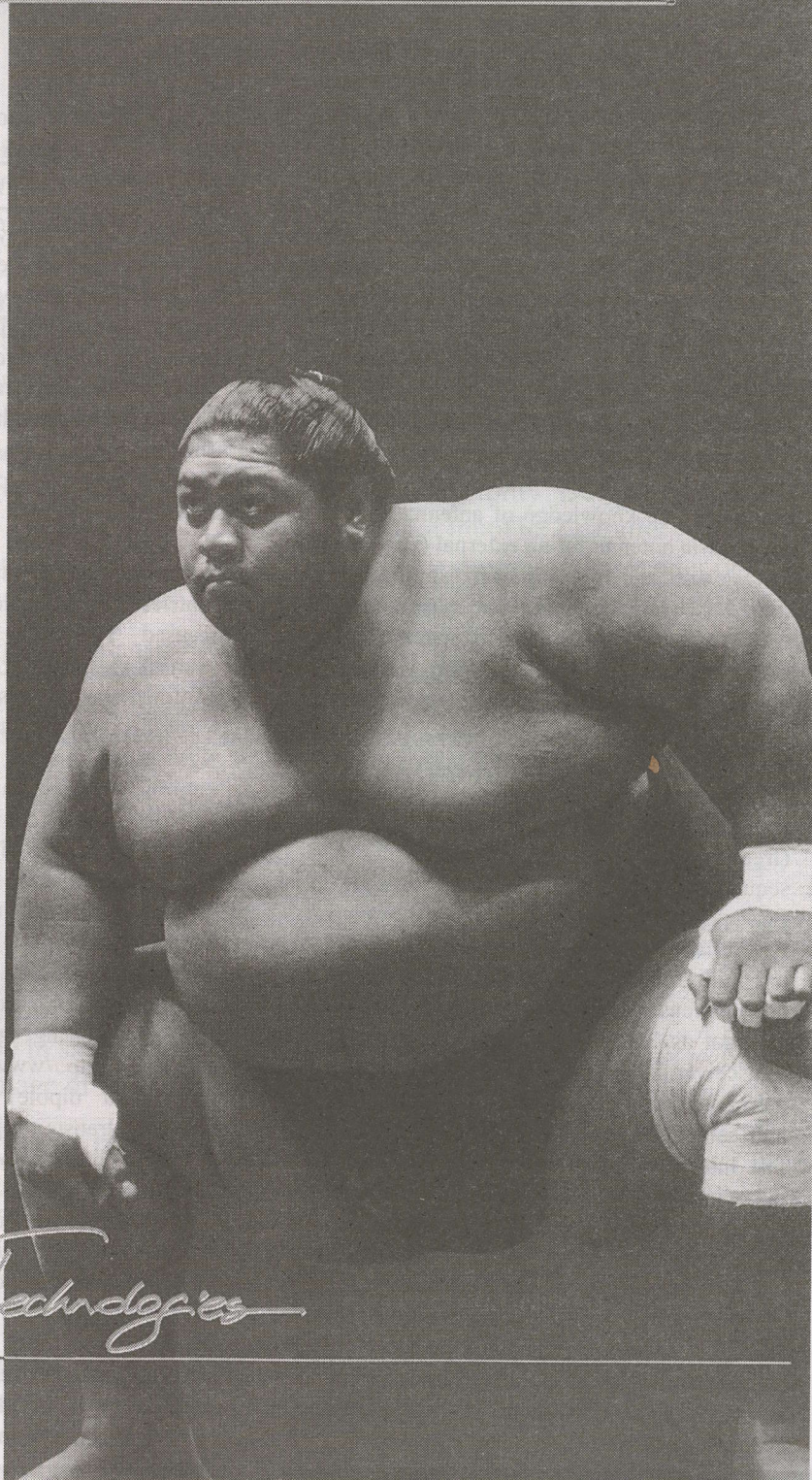
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It is not *how* you get there -

2.4 GHz as an interlinking and distribution opportunity

Microwaves (typically defined as above 1 GHz) do very well between two fixed points as long as there is LOS (line of sight - a visually clear view). That's the theory. In fact, microwaves "bounce and fill" very nicely in close to the transmitting antenna and are capable of penetrating building walls (if not sheet metal) and working their way around obstacles including tall buildings.

Between 1 GHz and 10 GHz, there are a handful of microwave frequency assignments which can be utilised without licensing by a government authority. However, the rules governing non-licensed use are strict and typically not encouraging if you wish to travel more than a few hundred metres between transmission source and receiving site.

Unlicensed microwave transmitters are now commonly available for the "2.4 gig band" (2,400 MHz, +/-) claiming reception ranges to 100m and more using short whip or "microwave patch" antennas. The 1 to 25 mw (milliwatt) transmitters typically utilise FM in a format that is familiar to anyone with analogue satellite reception, down to and including 6.2 or 6.8 MHz aural subcarriers. The unlicensed band, covering 2,400 to 2,483.5 MHz, has room to handle four FM channels each around 21 MHz wide.

100/200m transmission ranges are easily extended to several kilometres by replacing the whip or patch antennas attached to the store bought units with external gain antennas. But this requires some knowledge of antenna matching in substituting the built-in antenna for an external (yagi) system.

One watt and higher power "amplifiers" are also available (<http://www.giga-tech.de>), but may not be legal in countries where radiation is limited to specific levels for unlicensed transmitters. "LOS" paths to 25km are possible with 1 watt of power and 15 to 18 dB gain antennas on both the transmitting and receiving ends of the circuit.

More popular than shared television use of "2.4 gigs" is point to point "LAN" or wireless PC networking. An entirely new industry is forming to provide unlicensed FHSS (frequency hopping spread spectrum) and DSSS (Direct sequence spread spectrum) networking for home and business PCs (<http://www.x.net.au>). An especially enterprising Australian entrepreneur, Paul Young of Mornington (Victoria) has built 2.4 GHz community based wireless networks using this unlicensed technology, interconnecting PCs over distances as great as 25km. He supplies a "wireless network card" (a transceiver in the 2.4 GHz region) for the PC, a directional gain antenna (semi-bolic 17 dBi from USA Pacific Wireless), and cables for typically Australian \$800. But users get very fast Internet connections (2 to 11 Mbps), low latency (time delay in processing - typically 2 -3 microseconds compared to a telephone modem's 100+ microseconds) and direct PC to PC connection with other "node" users. This is one of those situations where "amateurs" (self-taught non-professionals) are demonstrating to Telstra/Optus/(NZ)Telecom just how effective leading edge technology can be when removed from the constraints of corporate overhead. Young will either end up a very wealthy man or badly disappointed creative technologist.



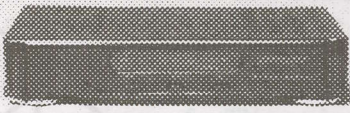
(US) Radio Shack four TV (switchable) channel TV package will do 100m or more with in-built antenna, several km's (+) with gain antennas.

By applying TVRO technology to the 2.4 gig license free region, employing separate vertically and horizontally polarised waves, 8 to 12 frequency modulated TV channels would fit into the available spectrum. One concept is to install a *single* satellite receive dish for, say, AsiaSat 2, take off all of the European Bouquet channels, and then relink them to an entire neighbourhood using 2.4 GHz unlicensed transmitters. In this way, only one home per block (or block of flats) needs a satellite dish antenna - neighbours would take the services from tiny 2.4 gig antennas perhaps installed on a window ledge or attached under a roof line. The home with the dish acts like a down sized "cable headend" installing a number of digital-analogue receivers to take the various services desired. The video and audio outputs go directly from the satellite receiver(s) to the RCA jacks on the input to the 2.4 gig transmitters. The transmitter(s) are connected to a small outdoor antenna which radiates the received signals directly to palm-sized receiving antennas connected by RG6 coaxial cable to a companion 2.4 GHz FM receiver. The receiver gives you a choice of band I RF to connect to the aerial input on a standard TV receiver, or A + V RCA jack signals for connection to the TV or VCR inputs. Typical receive sites could be done at a profit for under A\$350 each.

Antennas

The first step to conversion of a stock 100m range 2.4 GHz system is to replace the self-contained antenna with something offering gain and perhaps directivity. Pacific Wireless (<http://www.pacwireless.com>) has 7 and 10 dB gain (reference a dipole) omni-directional transmit antennas, directional transmit or receive antennas to 21 dB gain. M-Squared (<http://www.m2inc.com>) has low noise long yagi antennas which can be stacked into arrays offering 30+ dB of forward gain (see front cover, this issue). Substituting the in-built stock antenna with a suitable coaxial cable connector (type N is recommended for transmit, type F for receive) requires some skills to "match" the 2.4 gig circuits. Remember - maximum transfer of energy from transmitter or receiver to feedline and antenna requires precision impedance matching. Your range will be dramatically affected by how well you do this conversion.

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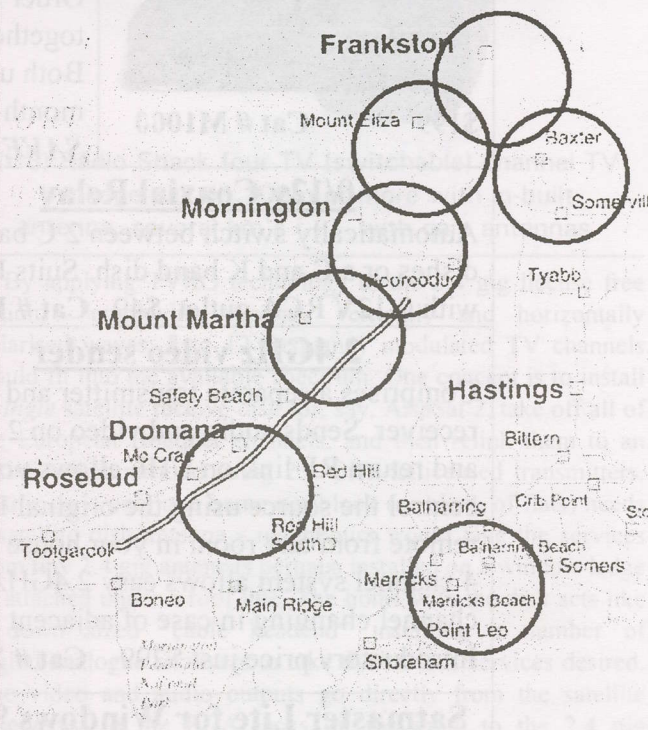
Another service option?

The map to the right should be familiar to readers in the region just south of Melbourne along the eastern shoreline of Port Phillip Bay. From Frankston on the north end to Dromana and Merricks Beach on the south, those seven "circles" represent ingenuity and coverage areas for 2.4 gigahertz unlicensed "wireless" computer networks (see p. 18, here).

For as long as there has been a struggling DTH/home dish business in Australia and the South Pacific, one of the major roadblocks to commercial success for the installing equipment dealer has been the complications surrounding both the costs and the bureaucracy associated with selling totally stand alone home receiving systems to each individual would-be-home viewing location. Not every home can manage a dish without special permits, neighbour unpleasantness and costs that typically exceed A\$1,500/NZ\$2,000.

Couple with that a marketplace reluctance to spend this kind of money to receive foreign (ethnic) programming and you find your business opportunities significantly reduced.

With the rapid development of wireless PC technology, a long forgotten terrestrial microwave band has suddenly become very important to the future of that industry. But if you are looking for "off-the-shelf" hardware that you can plug-in and run with, come back in six months or so. This is a new way to distribute TV programming, the hardware that is off-the-shelf is either high power but designed only for "spread spectrum" (LAN) PC linking, or, low power for room to room TV. It is the latter which offers us the possibility of setting up a single home as a "neighbourhood headend" and then retransmitting one or more channels over distances of a kilometre or so using low power 2.4 transmitters and high gain antennas. For those reading this where local laws do not prohibit higher power TV - hang on. European hardware



already exists in "amateur circles" and it should not be more than six months before it is available "off-the-shelf" out here in the Pacific.

Imagine the Melbourne ethnic neighbourhood where dishes are limited by neighbourhood zoning rules. Imagine the Russian neighbourhood that used to enjoy THT/NTV from 130E and now the only service available is low on the horizon at 80 or 75E. One sizeable ("headend") dish replaces a host of too-small, difficult to make play smaller antennas and the

MEMBERSHIP IN SPACE

Membership in SPACE Pacific is open to any individual or firm involved in the "satellite-direct" world in the Pacific and Asia regions. There are four levels of membership covering "Individuals," the "Installer/Dealer," the "Cable/SMATV Operator," and the "Importer/Distributor/Programmer."

All levels receive periodic programme and equipment access updates from SPACE, significant discounts on goods and services from many member firms, and major discounts while attending the annual SPRCS (industry trade show) each year (**Melbourne September 27-29, 2001**).

Members also participate in policy creation forums, have correspondence training courses available and their support makes possible the TV show SPACE Pacific Report. To find out more, contact (fax) 64-9-406-1083 or use information request card, page 34, this issue of SatFACTS. Page space within SatFACTS is donated each month to the trade association without cost by the publisher.

individual homes "plug in" with TV-style antennas (the shape and size is important to what happens next) far smaller than even the smallest acceptable satellite dish.

Costs? Yes, the "headend" service provider could well spend twice what a normal sized home dish system costs. But if he "shares" the service with even as few as 3 neighbours, the total cost for each if divided equally will be less than individual dishes at each home. In some ethnic neighbourhoods, it will be possible to do as many as 100 receivers off of a single transmitter.

Distances? The LAN PC folks are boasting of 25 to 30 km paths using high gain antennas on both ends. *But* - and it is a serious *but* - their spread spectrum frequency hopping technology allows use of up to 4 watts of transmitter power - that's 15 dB more "transmit signal" than the *legal* use of TV in the 2.4 gig band. "Legal" is as "legal" does of course - Nauru, PNG (and most other lesser developed countries) have no 2.4 gig power restrictions for TV so when you combine 4 watts of TV power with 20 dB gain of transmit (and receive) antennas, certainly 25 km if LOS (line of sight) is not out of the question.

For most applications, a couple of km is adequate, especially in highly concentrated housing developments. That's part of the beauty of 2.4 gig - it rolls and fills nicely and because the TV is FM transmitted (like satellite), it doesn't have all of those annoying terrestrial TV artefacts (ghosts, buzzing audio and the like).

And we are already planning extensive hands-on system demonstrations and support sessions for 2.4 GHz rebroadcasting at SPRSCS 2001 in Melbourne because by then most of the learning curves will have been perfected and equipment will be off the shelf available for TV relays.

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COMSTAR mesh dishes antennas 2.3 to 3.2m

JONSA dishes 0.65 to 2.4m

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The CABLE Connection



Your fault - their fault???

One of the more annoying day to day problems associated with operating a cable TV system is line outages. The phone rings, a customer saying "the cable is off." Followed in a few seconds by more phone calls. Lots of phone calls.

They calls quickly tell you the geographic area where the outage has occurred, but you have no way of knowing even after plotting where the calls originated whether the problem is yours or theirs. "Theirs" in this case is the local power company.

With multiple cable TV power supplies, not backed up by standby batteries or UPS supplies, if the local power company shuts down a segment of their power plant to connect up a new customer or just to be mischievous, it is not uncommon to have one of your cable power supplies also deprived of AC mains voltage. When AC mains stops, the cable power supply stops and any amplifiers powered from that power supply location quit working. In long, thin plants, shutting off power to a mid-plant power supply shuts down all cable service from that power supply location onward to the end of the plant.

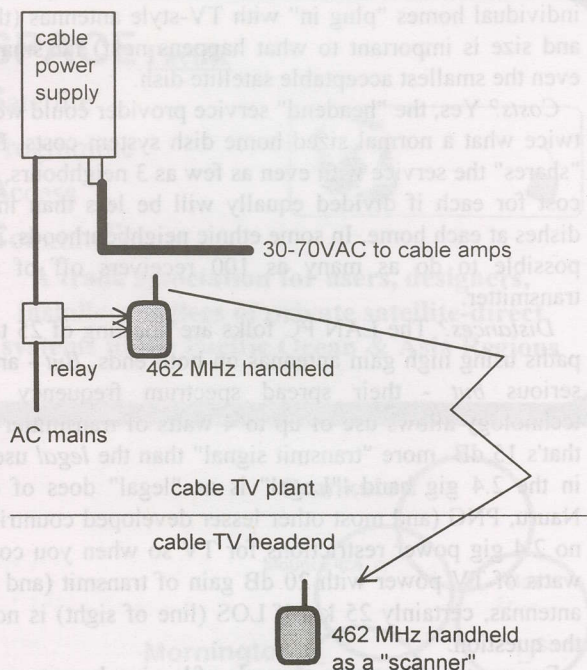
On the other hand, when cable stops working and calls start coming in, the problem could also be your own. An amplifier may have quit, or some idiot with a backhoe may have just dug up your trunk line.

Here is our approach to determining before we roll a service truck where the problem is located and what it might be.

FRS stands for "Family Radio Service." This is a set of 14 FM two-way channels in the 462 MHz region. Tiny (palm size and smaller with built-in whip antenna) handheld radios boasting up to 1 watt of power operate from 4 AAA cells. You will find a sizeable selection of these transceivers at Radio Shack (USA <http://www.radioshack.com>) on pages 78 - 81 of their 2001 catalogue.

Each cable TV power supply is connected to the mains (230-260 VAC) and it steps down the mains voltage to (in our case) 67 VAC which is then sent through the coaxial cable network to power individual amplifiers. The cable TV supply is current limited in most applications and with an average trunk amp consuming around 1 amp of current, a typical supply will operate 12 or so line amplifiers. The traditional approach is to locate the power supply in the middle of a cable TV plant segment so that it powers a more or less equal number of signal amplifiers in both directions from the power supply location.

First you install a DPDT relay in the mains-in line to each power supply. Wire it up so the relay is normally closed when the commercial AC mains voltage is present. Now, using the double pole, double throw connections on the mains voltage relay, wire it up so that if the AC mains voltage fails two things happen:



Using "FRS" radios for monitoring cable powering

1) The 462 MHz transceiver located at the power supply location has its internal AAA battery supply activate the transceiver (turn it on), and,

2) Key the transceiver so that it is transmitting (some models have push to talk or VOX - voice operated - handset connections which can be tapped for this purpose).

At the cable headend or office, install another of the palm sized receivers and replace its four AAA cell supply with an external 6 volt power pack supply. Now turn it on and push the scan button on the office located receiver.

With 14 channels available in the FRS radios, as many as 14 power supply locations can be "monitored" at the office or headend.

When AC power fails at a power supply location, the normally closed mains relay opens. This causes the DPDT connections on the relay to turn on the FRS radio in the transmit mode. The signal it radiates is front panel adjustable to any of the 14 channels and by internally assigning a different FRS channel to each of (up to) 14 power supplies, you will instantly know where the AC mains has failed and which power supply is shut down simply by reading out from the office/headend scanning receiver which "channel" (power supply location) the scanner stops at. The FRS receivers scan all 14 channels in less than one second.

FRS radios are commonly available at virtually all major consumer stores in America, often for under US\$25 each at the 100 mw level. We find they cover 1 to 1.5 miles nicely from handheld to handheld and if you install an elevated outdoor antenna on the scanner unit at the office/headend, twice or three times that distance is common. You can protect the monitoring units located at power supplies by slipping a 3 inch diameter piece of PVC or conduit with a cap on top over the radios. As the AAA batteries only function when the AC mains fails causing the relay to open you can expect near shelf life battery reliability.

Other applications

The low cost of the FRS radios suggests some additional cable plant monitoring applications. Here are a few:

1) *Install FRS units at plant ends* - the outer reaches of your cable lines.

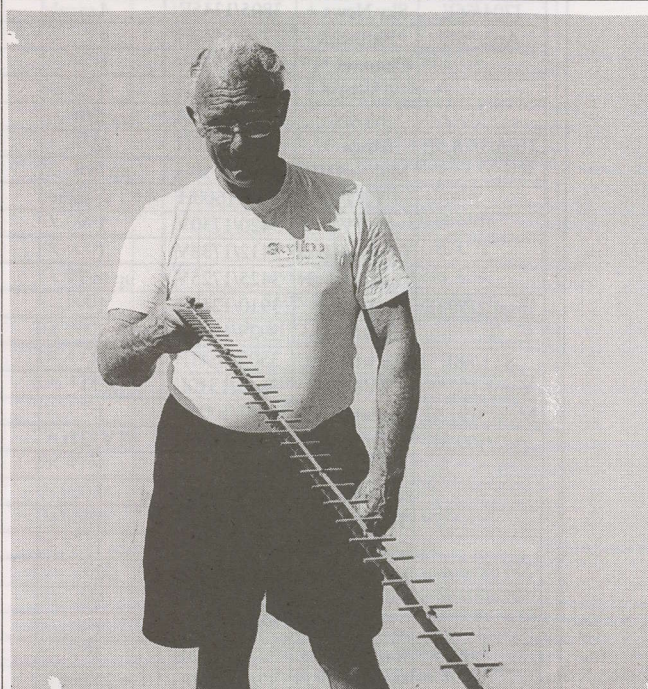
Replace the AAA battery pack with an AC mains adapter and install a timing circuit to activate the FRS transmitter for 30 seconds say once every five minutes. Now find a junker TV set, install it at a suitable end-of-line location and disconnect the visual display portion to cut down on power consumption. Locate the audio line (or use an earphone jack) and borrow the TV set audio as a replacement for the built-in microphone audio in the FRS unit.

With the TV set tuned to a cable channel, each time the FRS unit is "keyed" for 30 seconds, the TV audio modulates the FRS transmitter. At your office or headend, you have a timely way of monitoring the quality and performance of your CATV system by simply scanning to or monitoring the appropriate FRS radio channel.

2) *Install FRS units at public locations* where cable TV is on display. Provide a hand held microphone and "invite" interested consumers in the public spot to "call in and ask questions about having cable TV in their home." With the ability to scan up to 14 separate locations, and a scanning unit installed in your cable office, you can answer queries directly in a "high tech" way that should impress potential customers.

3) *Create a cable "two-way" public discussion service channel.* Jazz up a local video announcement, community service channel by installing FRS units at schools, local meeting halls, local stores where cable is on display. Call it "talk-back TV" and invite the community to use the (audio) channel to voice their opinions on local issues.

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SatFACTS Pacific/Asian MPEG-2 Digital Watch: 15 October 2000

Bird	Service	RF/IF &Polarity	# Program Channels	FEC	Msym
I704/66E	Sky News +	3805/1345R	4	3/4	22(.520)
Ap2/76E	Hallmark	3720/1430H	4	5/6	29(.270)
	Channel "I"	38230/1330V	1	3/4	3(.570)
	TVB8 +	3849/1301H	4	3/4	13(.238)
	AXN	3920/1230H	up to 8	7/8	28(.340)
Them3/78.5E	Mega +	3640/1510H	12	3/4	28(.056)
	Mahar/DD1	3600/1550H	up to 8	3/4	26(.661)
	TRT +	3551/1600H	4+ TV, radio	3/4	13(.330)
	PTV2	3420/1730V	1	3/4	3(.366)
	TV Maldives	3412/1738V	1	1/2	6(.312)
	Thai Global+	3425/1725V	up to 7?	2/3	27(.500)
Insat 2E/83E	DD2	3910/1240V	1	3/4	5(.000)
	DD tests	3929/1221V	1	3/4	5(.000)
ST1/88E	Taiwan Bqt	3509/1641H	13	3/4	23(.450)
Yaml-102/90	TV6 Bqt	3645/1510L	3(+)	3/4	17(.900)
MeSt 1/91.5E	Malay. TV3	4147/1004H	1	3/4	7(.030)
As2/100.5E	Euro Bouqt	4000/1150H	6TV, 21r	3/4	28(.125)
	Reuters	3909/1241H	1	3/4	5(.632)
	Hubei/HBTv	3854/1296H	1	3/4	4(.418)
	Hunan/SRT	3847/1303H	1	3/4	4(.418)
	Guan./GDTV	3840/1310H	1	3/4	4(.418)
	In. Mongolia	3828/1322H	2	3/4	8(.397)
	APTN A-O	3799/1351H	1	3/4	5(.631)
	WTN Jer/Lon	3790/1360H	1	3/4	5(.631)
	Reuters/Sing.	3775/1375H	1	3/4	5(.631)
	WorldNt/US	3764/1386H	1 + 20 radio	3/4	6(.100)
	Liaonin/Svc2	3734/1416H	1	3/4	4(.418)
	Jiangxi/JXTV	3727/1423H	1	3/4	4(.418)
	Fujian/SETV	3720/1430H	1	3/4	4(.418)
	Hubei TV	3713/1437H	1	3/4	4(.418)
	Henan/Main	3706/1444H	1	3/4	4(.418)
	Egypt/Nilesat	3640/1510H	6+, radio	3/4	27(.850)
As2/100.5E	Feeds	4086/1064V	1	3/4	5(.632)
	TVSN	4033/1117V	1	3/4	4(.298)
	Sky Racing	4020/1130V	up to 3TV	1/2	18(.000)
	EMTV	4006/1144V	1TV, 2 radio	3/4	5(.632)
	Jilin Sat TV	3875/1275V	1	3/4	4(.418)
	HeiLongJian	3834/1316V	1	3/4	4(.418)
	JSTV	3827/1323V	1	3/4	4(.418)
	Anhui TV	3820/1330V	1	3/4	4(.418)
	ShaanxiQQQ	3813/1337V	1	3/4	4(.418)
	Guan/GXTV	3806/1344V	1	3/4	4(.418)
	Fashion TV	3796/1354V	1	3/4	2(.533)
	MSTV	3791/1359V	1	3/4	4(.340)
	Feeds	3785/1365V	1	3/4	5(.632)
	Myawady	3766/1384V	1	7/8	5(.080)
	SABe	3742/1408V	1	3/4	3(.300)
	Saudi TV1	3660/1490V	1 (?)	3/4	27(.500)
As3S/105.5E	Zee bouquet	3700/1450V	9TV	3/4	27(.500)
	ETV Bangla.	3749/1401V	1TV	3/4	4(.340)
	Arirang TV	3755/1395V	1	7/8	4(.418)
	Now TV	3760/1390Hz	2	7/8	26(.000)
	Star TV	3780/1370V	17(+)/TV	3/4	28(.100)
	Star TV	3860/1290V	14(+)/TV	3/4	27(.500)
	Star TV	3880/1270H	12(+)/TV	7/8	26(.850)
	CNNI	3960/1190H	4(+)/TV	3/4	26(.000)
	Star TV	4000/1150H	7(+)/TV	7/8	26(.850)
	Sun TV	4095/1055H	1	3/4	5(.554)
	CCTV bqt	4115/1035H	4(+)/TV	3/4	19(.850)
Cak1/107.5E	Indovision (S-band)	2.536, 2.566, 2.596, 2.626	33(+)/TV	7/8	20(.000)
Sinosat/110E	CCTV2	3889/1261Hz	1	3/4	3(.000)
C2M/113E	TPI	4185/965V	1	3/4	6(.700)
	News Asia	4071/1079H	1	3/4	14(.043)
	Anteve	4055/1095V	1	3/4	6(.510)
	Space TV	4000/1150H	11TV, radio	3/4	26(.666)
	C Net Taiwan	3760/1390H	11TV, radio	3/4	26(.666)

Receivers and Errata

Sky News 24 hr, sport, feeds; some FTA
PowVu, typ. CA; Kermit now gone
Tests, FTA
PowVu, CA
Tests, promos, ch 5 FTA
Mega Cosmos here; new Sr
USA religion chs FTA
3 Angels USA, Ch of Hope, + 9 radio
FTA, not seen Australia
FTA (reaches SE Australia)
FTA
SCPC, testing MPEG-2; OK E. Aust.
SCPC, weaker than 3910 above
MCPC, sometimes FTA , 2 adult chs
also try Sr15.900; unlikely south of eqtor
CA but occ. FTA
FTA (TV5 teletext); now includes RTPi
occasional feeds, some FTA MPEG2
FTA SCPC, teletext
FTA SCPC, teletext
FTA SCPC, radio APID 81
FTA: #1 Mongolian, #2 Mandarin
mostly 4:2:2 SCPC (news feeds)
Mostly CA; some FTA
FTA & CA
FTA; up to 20 radio channels
FTA SCPC, radio APID 256
FTA SCPC, teletext, radio APID 81
FTA SCPC, + radio APID 80
FTA SCPC, radio APID 80
FTA SCPC, + radio
Thru TARBS Aust, subs now OK
FTA SCPC feeds
Occ. FTA , not same as Aust. version
(Irdeto) CA; 1 & 3 occ. FTA
PowVu CA; poor signal level
FTA SCPC, + radio
FTA SCPC
FTA SCPC, + radio
FTA SCPC
FTA SCPC, radio APID 81
FTA SCPC, radio APID 257
FTA SCPC,
FTA SCPC
FTA & CA, feeds
FTA SCPC - difficult to load
SCPC - now regular programming
FTA MCPC
Mediaguard CA, ch 8 FTA
PowVu but FTA at this time
FTA SCPC; audio problems (see p. 29)
also check 3900/1250Vt, same #s
NDS CA (Pace DVS211, Zenith)
NDS CA (Pace DVS211, Zenith)
NDS CA (Pace DVS211, Zenith)
PowVu CA, some FTA feed channels
NDS CA (Pace DVS211, Zenith)
"History Channel" testing SCPC
was analogue; now FTA MCPC
NDS CA using RCA/Thomson,
Pace IRDs
FTA SCPC, difficult to load
FTA SCPC; NT only
May only be test; NT+Asia only?
FTA SCPC; NT only
CA, sometimes FTA
CA, subs available -10 radio typ. FTA

Bird	Service	RF/IF & Polarity	# Program Channels	FEC	Msym
(C2M/113)	RCTI	3475/1675H	1	3/4	8(.000)
	Tests	4000/1150Hz	3	3/4	26(.662)
JcSat3/128	Miracle Net	3990/1160V	3 up to 6	5/6	22(.000)
	Asian bqt	3960/1190V	up to 8	7/8	30(.000)
MeaSat 2	Astro Mux	11.478H (+)	up to 7TV	7/8	30(.000)
	Mediasat	11.540Hz	1+TV, tests	3/4	30(.800)
Op B3/156	Mediasat	12.336V	5TV, 3ra, Inter.t	2/3	30(.000)
	Aurora	12.407V		2/3	30(.000)
	Aurora	12.532V	Inc Zee, ATV	2/3	30(.000)
	Aurora	12.595V		3/4	30(.000)
	Aurora	12.720V		3/4	30(.000)
	Austar/tests	12.376H		3/4	29(.473)
	Austar/Foxtl	12.438H		3/4	29(.473)
	Austar/Foxtl	12.564H		3/4	29(.473)
	Austar/Foxtl	12.626H		3/4	29(.473)
	Austar/Foxtl	12.688H	(some FTA ra)	3/4	29(.473)
Op B1/160	ABC NT fd	12.256V	1TV, 3 radio	3/4	5(.026)
	Central 7	12.354H	1TV	3/4	3(.688)
	News feeds	12.367H	1	3/4	5(.424)
	Sky NZ	12.518/546V	7TV/7TV	3/4	22(.500)
	Sky NZ	12.581/608V	6TV/6TV	3/4	22(.500)
	Sky NZ	12.644V	9TV	3/4	22(.500)
PAS8/166	ABCInterch	12.312H	1	3/4	6(.978)
	ABCInterch	12.321H	1	3/4	6(.978)
	ABCInterch	12.330H	1	3/4	6(.978)
	TARBS	12.526H	12+ TV	3/4	28(.067)
	TARBS2	12.606H	6+TV	3/4	28(.067)
	JEDI/TVB	12.686H	11+ TV	3/4	28(.124)
	Boomerang	12.725H	5 TV	7/8	25(.728)
	NHK Joho	4065/1085H	6TV, 1 radio	3/4	26(.470)
	ESPN USA	4020/1130H	7+TV, data	7/8	26(.470)
	Discovery	3980/1170H	8 typ.	3/4	27(.690)
	CalBqt/Pas8	3940/1210H	up to 8TV	7/8	27(.690)
	CNBC HK	3900/1250H	up to 7TV	3/4	27(.500)
	Filipino Bqt	3880/1270V	up to 9 TV	7/8	26(.050)
	Feeds	3854/1296H	1	3/4	6(.110)
	CNNI	3780/1370H	3, up to 5 TV	3/4	25(.000)
	MTV	3740/1410H	8	2/3	27(.500)
PAS2/169	Pv Bouquet	12.290V	2+ TV, radio	2/3	27(.500)
	WA PowVu	12.637(.5)V	4TV, 8 radio	1/2	18(.500)
	HK PowVu	4148/1002V	up to 8	2/3	24(.430)
	Fox Bouquet	3992/1158V	8TV/data	7/8	26(.470)
	Feeds	3942/1208V	1 or 2	2/3	7(.497)
	Feeds	3934/1216V	1	3/4	10(.850)
	Feeds	3926/1224V	1	3/4	13(.091)
	Feeds	3912/1238V	1	2/3	6(.620)
	Feeds	3898/1252V	1	2/3	12(.000)
	Feeds	3812/1338V	1	3/4	6(.620)
	Middle East	3778/1372V	4	3/4	13(.331)
	CCTV Pv	3716/1434V	5 typical	3/4	19(.850)
	Feeds	4138/1012H	1	3/4	6(.620)
	7thDyAdv	3872/1278H	1TV, 4+ audio	3/4	6(.620)
	CNNI HK	3996/1154H	1	3/4	9(.998)
	"1"/Korea	3980/1170H	1	3/4	4(.420)
	Feeds	3867/1183H	1	2/3	6(.618)
	Feeds	3939/1211H	2 (typ NTSC)	2/3	6(.620)/7(.498)
	Cal PowVu	3901/1249H	up to 8	3/4	30(.800)
	Feeds	3854/1296H	1	2/3	6(.620)
	Disney	3804/1346H	3	5/6	21(.093)
	Satcom 1-6	3743/1407H	up to 5	7/8	19(.465)
I702/177E	AFRTS	4177/973LHC	8TV, 12+ rad	3/4	26(.694)
I701/180E	TNTV	11.060V	9	3/4	30(.000)
	Tele Fenua	11.168V	4	3/4	10(.100)
	Canal+ Sat	11.610H	16TV, 1 radio	3/4	30(.000)

Receivers and Errata
FTA SCPC, Australia OK
FTA (2) and CA
PowVu, some FTA (1,3)
CA & FTA Ntsc: Japan, Taiwan
Aust east coast beam; also 11.664Hz
regular operation shortly
CA, some FTA, Herbalife
cvrs Aust, NZ 90 cm; CA
cvrs Aust, NZ 90 cm; CA
CA, \$105 smart card required (p. 28)
CA, \$105 smart card required (p. 28)
Austar I-TV tests
CA, subscription available Australia
CA, subscription available Australia
CA, subscription available Australia
CA, subscription available Australia
FTA, Sydney -30 minutes time zone
FTA, purpose here unknown
FTA; Imparja
NDS CA, subscription available NZ
NDS CA, subscription available NZ
NDS CA, subscription available NZ
PowVu, FTA, news feeds
PowVu, FTA, news feeds
PowVu, FTA, ABC Melbourne feeds
TPG /Eurodec CA, occ. FTA
Tests, inc. ESPN, see TARBS above
Irdeto CA, some FTA tests
CA, subscriptions avail Australia
PowVu CA & FTA ; subscription avail
PowVu CA; ch 11 DCP-CCP bootload
PowVu/CA (some audio FTA)
PowVu CA & FTA (EWTN/EB Net)
FTA at this time
Some FTA; also 4040V, 27.686, 7/8
occ. feeds, inc. Mediasat Sydney
PowVu, FTA at this time
CA; #7,8 FTA feeds
PowVu CA, WIN, ABC NT
PowVu CA, WA only - D9234
PowVu CA; some FTA
Pv, CA/FTA (FTA ch 3 only)
PowVu (FTA) occ feeds
PowVu (FTA) occ. feeds
Mediasat links, 7th Day Adv. feeds
PowVu(FTA) occ. feeds
(PowVu) FTA, occ. feeds
PowVu (FTA) occ feeds
FTA, testing CA, "threatening"
PowVu FTA; # pgm chs varies
FTA SCPC/MCPC, news and sports
Sat, Sun 0930 UTC typ.
reverse link HK/Atlanta, feeds, FTA
FTA SCPC, tests(not full time)
FTA (occ. sport feeds)
FTA-typ. NTSC-occ. sport, shuttle
(PowVu) CA+ FTA
(PowVu) occ. feeds
PowVu CA
currently FTA, lowlevel, Mid East fds
PowVu CA
Testing new pay-TV service, east beam
Tests, may be off
Mediaguard CA, one FTA

Bird	Service	RF/IF & Polarity	# Program Channels	FEC	Msym
(1701/180E)	TVNZ	4195/955RHC	1	3/4	5(.632)
	TVNZ/BBC	4186/964RHC	1	3/4	5(.632)
	TVNZ	4178/972RHC	1	3/4	5(.632)
	TVNZ/Aptn	4170/980RHC	1	3/4	5(.632)
	RFO-Canal+	4086/1064L	4TV, radio	5/6	13(.347)
	TVNZ feeds	4044/1106R	1	3/4	5(.632)
	NZ Prime TV	4024/1126L	1	2/3	6(.876)
	NBC to 7 Oz	3960/1190R	1	7/8	6(.447)
	Ioarana	3772/1378L	1	3/4	4(.566)
	TVNZ	3846/1304R	1	3/4	5(.632)
	10 Australia	3765/1385R	6	7/8	29(.900)

Receivers and Errata

DMV/NTL early version, occ feds, typ ca
DMV/NTL early version, occ feds, typ ca
DMV/NTL early version, occ feds, typ ca
DMV/NTL early version, occ feds, typ ca
east hemi 20.5 dBw, to be 15.5 soon
SCPC, mixed CA and FTA feeds
PowVu CA; Auckland net feeds
CA, Leitch encoded
FTA SCPC; East Hemi Beam-Tahiti
SCPC, mixed CA & FTA, feeds
PowVu CA & FTA; #3 TBN

BOUQUETS - FTA vs. CA: FTA (free to air) services appear as SCPC (single channel per carrier) and within MCPC (multiple channels per carrier). FTA services here are shown **bold face**, when FTA is occ(asional) or only for a portion of MCPC bouquets, **bold face** appears in right hand column. PowVu stands for Scientific Atlanta PowerVu which is accessible even when FTA only when the IRD has been software-designed to process SA's unique version of MPEG-2. SA IRDs, such as D9223, can be equipped with MPEG-2 standard or may only be capable of receiving SA's version of MPEG-2, even for FTA services. SA offers an over-the-air software update for existing non-MPEG-2 versions of the receiver (see bottom of this page). Not all receivers automatically receive MPEG-2 transmissions which have variations of the MPEG-2 software "standard." PID numbers are discussed in our web site (<http://www.satfacts.kwikkopy.co.nz>). Not all IRDs can deal with PID entry - virtually all 1999 and 2000-new models will do this (PID numbers can be found at <http://www.lyngsat.com/>). In tables, "# Programme Channels" indicates the total number of video + accompanying audio the IRD should load if you load the bouquet. Most IRDs ask you if you wish to load "FTA Only?" or "All including CA." Typically, load "all" even if you cannot routinely access CA services.

MPEG-2 DVB Receivers: (Data here believed accurate; we assume no responsibility for correctness!)

ADI MediaMate. FTA, NTSC+PAL outputs. (Pacific Digital Sys. Pty Ltd, tel 61-2-8765-0270)

AV-COMM R3100. FTA, excellent sensitivity (review SF May 1998); new version Sept. '99. Av-COMM Pty Ltd, 61-2-9949-7417.

Benjamin DB6600-CI. FTA, Foxtel/Austar w/CAM+card. Autosat Pty Ltd 61-2-9642-0266 (review SF#72)

Grundig DTR1100. Mfg by Panasat (SA), very similar to Panasat 630; out of production, Irdeto capable. See Av-COMM above.

Humax F1-CI. Primarily sold for TRT(Australia), does (limited) PowerVu (not Optus Aurora approved).

Hyundai-TV/COM. HSS100B/G (Pacific), HSS-100C (China) FTA. Different software versions; 2.26/2.27 good performers, 3.11 and those with Nokia tuners also good; later 5.0 not good. SATECH (V2.26)

Hyundai HSS700. FTA, PowerVu, SCPC/MCPC. Review SF March 1999. Kristal Electronics, 61-7-4788-8906.

Hyundai HSS800CI. FTA, Irdeto (with CAM) + other CA systems, PowerVu, NTSC. Kristal Electronics, above; review SF#63.

MediaStar D7. FTA, preloaded w/ known services, exc. software (review SF July 1998). MediaStar Comm. Int. 61-2-9618-5777

MediaStar D7.5. New (May 00) single chip FTA; review June 00 SF. MediaStar Comm. Int. 61-2-9618-5777

MultiChoice (UEC) 660. Essentially same as Australian 660, not grey market contrary to reports. Sciteq tel 61-8-9306-3738

Nokia "d-box" (V1.7X). European, FTA, may only be German language, capable of Dr. Overflow software. Tricky to use.

Nokia 9200. When equipped with proper CAM, does Aurora, pay-TV services provided software has been "modified" with Dr Overflow or similar program was available from (www.BAKKERELECTRONICS.COM). Note: This site shut-down by Mindport). Reported factory 12 mo. warranty. Peter Older, tel 61-3-5133-7911, mobile 61-0418-386287

Nokia 9500/9600. Numerous versions for different world parts; not distributed in Pacific but assistance from Av-Comm Pty Ltd.

Nokia 9800. Latest single chip version, with CI and Irdeto capable. No software for Pacific, Asia; not recommended.

Pace DVS211. NDS CA (no FTA) for Star Asia, previously used for Indovision. (Solution 42, 61-2-9820-5962)

Pace DGT400. Originally Galaxy (Now Foxtel+Austar). Irdeto, some FTA with difficulty (Foxtel Australia 1300-360818)

Pace DVR500. Original DGT400 modified for NBC (PAS-2) affiliate use, with CAM equivalent to DGT400 but more reliable.

Pace "Worldbox" (DSR-620 in NZ). Non-DVB compliant NDS CA including Sky NZ, no FTA; similar "Zenith" version.

Pacific Satellite DSR2000. Advises no longer current model (see. p. 2, here); Clone of Mediastar D7 (see above)

Panasat 520/630/635. MCPC FTA, Irdeto capable, forerunner UEC 642, 660. Out of production, spares fax ++27-31-593-370.

Panasonic TU-DS10. FTA + Irdeto CA; one of 2 IRDs approved by Optus for Aurora, but no longer available in Australia.

Phoenix 111, 222. PowVu capable, NTSC, graphics, ease of use. (111 review SF#57). SATECH(below)- 222 out of production

Phoenix 333. FTA SCPC, MCPC, analogue + dish mover. Detailed SF review Nov. 1998. SATECH 61-3-9553-3399.

Pioneer TS4. Mediaguard CA (no FTA), embedded Msym, FEC, only for Canal+Satellite (AntenneCal ++687-43.81.56)

PowerCom. FTA, PowVu, NTSC, excellent sensitivity. NetSat 61-2-9687-9903.

PowerVu (D9223, 9225, 9234). Non-DVB compliant MPEG-2 unless loaded with software through ESPN Boot Loader (see below). Primarily sold for proprietary CA (NHK, GWN+ PAS-2 Ku, CMT etc). Scientific Atlanta 61-2-9452-3388.

Praxis/DigiMaster 9600 MKII/9800AD. FTA, PowVu+analogue, withdrawn from sale in Pacific (was Skyvision-below)

Praxis 9800 ADP. FTA SCPC/MCPC, PowVu, analogue, positioner. SF review Dec '98; withdrawn from Pacific sale (below).

Prosat 2102S. FTA SCPC/MCPC, NTSC/PAL, SCART + RCA. Sciteq 61-8-9306-3738.

SatCruiser DSR-101. FTA SCPC/MCPC, PowVu, NTSC/PAL. (Skyvision Australia 61-2-6292-5850, Telsat 64-6-356-3749)

SatCruiser DSR-201P. FTA SCPC/MCPC, PowVu, NTSC/PAL, analogue, positioner - review this issue (Skyvision - see above).

Skandia SK888 (aka DigiSkan-SMS). FTA MCPC, Irdeto CAM+software upgrade. Out of production; Skandia 61-3-9819-2466

Strong SRT 4600. SCPC, MCPC, PowerVu; exc graphics, ease of use, review SF#64. SATECH 61-3-9553-3399.

Sky 21/SJ 3000ci. Claims "clone" Hyundai HSS800ci; if so, poor copy. Runs very hot, reportedly burns up smart cards

UEC642. Designed for Aurora (Irdeto), approved by Optus; limited other uses. Nationwide 61-7-3252-2947.

UEC660. Upgraded UEC642, used by Sky Racing Aust., Foxtel-limited FTA. (Nationwide - above); power supply problems.

UEC700/720. Single chip Irdeto built-in design for Foxtel; unfriendly for FTA. Power supply problems, not sold to consumers.

Xanadu. DVB compliant special receiver for members of SPACE Pacific (Av-comm Pty Ltd, tel +61-2-9949-7417)

Yuri HSS-100C. FTA, clone of Hyundai, V2.27 software custom to Australia (Nationwide-above).

Accessories:

Aurora smart cards. New v1.6 now available, 1.2 no longer available for RABS. Price now A\$105, Sciteq 61-8-9306-3738.

PowerVu Software Upgrade: PAS-8, 4020/1130Hz, Sr 26.470, 7/8; pgm ch 11 and follow instructions (do not leave early!)

SatFACTS Pacific/Asian FTA ANALOGUE Watch: 15 October, 2000

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BIRD/Location	RF/IF & Polarity	Service	Errata
I703/57E	3808/1342R	Udaya TV	
	4052/1098R	WorldNet	VOA subers.
	4178/972L	MTA Inter.	
I604/602/60E	4166/984	various feeds	
I704/66E	3765/1385R	tests	
	4015/1135L	Mongolia	(SECAM)
PAS4/68.5E	3743/1407V	RTPi	(+ radio suber)
	3864/1286V	BBC World	
	3907/1243H	Sony TV	Hindi
	4034/1116V	Doordan	(various)
	4087/1063H	CNNI	
	4110/1040H	TNT/Cartoon	
	4113/1037V	Series Ch.	
	4182/968H	MTV	
PAS7/68.5E	3470/1680V	test signal	
LM1/75E	3980/1170V	various	(Madagascar)
Thaicom3/78E	3871/1279H	TVT	
	3760/1390V	Army TV	
	3685/1465V	MRTV	hot to NSW
	3685/1465H	VTV	6.6, 7.02
	3616/1534V	ATN	
	3576/1574V	ATN Bangalr	Bengali
	3554/1596V	test card	
	3536/1614V	Punjabi TV	(occ service)
	3507/1643V	RAJ-TV	
	3489/1661H	Vasta Music	occ tests
	3465/1685V	RAJ-TV	
Expres 6A/80E	3675/1475R	RTR	(global beam)
InSat 2E/83E	3481/1669V	Sun TV	
	3562/1588V	Vijay/Asianet	aud. 5.5/6.6
	3599/1551V	JayaTV	
	3810/1340V	DD1-Tamil	"
	3850/1300V	DD1-National	"
	3930/1220V	DD2 Metro	"
	3970/1180V	Teluga 1	"
	3998/1152V	sport feeds	"
	4035/1115V	Sun TV	"
	4060/1090V	Surya/Sun TV	"
	4093/1057V	DD7	"
ChnStr1/87.5E	3880/1270H	occ feeds/ card	P4 NSW, Ntsc
ST1/88E	3550/1600V	test card	
	3582/1568V	Nila TV	(vintage TV)
Yamal 102/90E	3675/1475R	RTR1	P3 NSW
	3875/1275R	Orbita 1	
	3916/1234R	RTR II	
	3935/1215R	Orbita II	
MeSat-1/91.5E	3710/1440H	VTV1,2, 4	
	3880/1270H	RTM-1	
Gz 28/96.5	3675/1475R	RTR	inc +/- 3.7
Chinasat22/98	3900/1250H	tests	+ 3940/1210
InSat 2B/93.5E	4165/985H	India Metro	NSW on 3.7m
	4080/1070V	DD7 (Tamil)	
	4070/1080H	DD9	
	3970/1180V	DD9 (Kan.)	
	3882/1268V	DD1	
	3840/1310V	DD?	
	3762/1388V	DD4	
AsSat2/100.5E	3660/1490V	feeds, tests	
	3680/1470H	feeds	
	3860/1290V	feeds	

BIRD/Location	RF/IF & Polarity	Service	Errata
(As2/100.5E)	3885/1265H	WorldNet	VOA subers
	3960/1190H	CCTV4	
	3980/1170V	RTPi	(radio gone)
Exp. 9/103E	3675/1475R	RTR	inc +/- 2.1
	3875/1275R	Vrk Apt	
As3S/105.5E	3640/1510H	Asia Plus	China, 6.6
	3660/1490V	Urdu TV Net	6.6, 7.2 audio
	3680/1470H	CETV	
(temp FTA)	3800/1350H	Star Sport	NTSC
(temp FTA)	3840/1310H	Channel [V]	NTSC
	3900/1250V	AlphaTV Punja	
(temp FTA)	3920/1230H	Phoenix Ch	NTSC
	3940/1210V	Zee India	
	3980/1170V	Zee TV	
	4020/1130V	Sahara TV	6.2, 6.8
	4100/1050V	PTV2/World	
T'kom1/108E	4000/1150H	tests	
PalapC2/113E	4160/990H	(France) TV5	
	4140/1010V	Brunei + feeds	
	4120/1030H	MTV Asia	
	4080/1070H	Herbalife	+ tests
	4040/1110H	CNBC	
	3970/1180V	CNNI	
	3920/1230H	CNNI	tests
	3880/1270H	Aust ATN7	
	3840/1310H	TVRI	tests
	3742/1408V	RCTI	English suber
AsSat1/122E	3677/1473V	Test card	& 3933/1217H
ChinS 6/125E	4085/1065V	feeds	seldom seen
JcSat3/128E	3768/1382V	feeds	occ., P5 NZ
	4085/1065V	test card	NTSC. 6.8 aud.
Ap1A/134E	4160/1050V	CETV	
	3980/1170V	CETV1	
	3900/1250V	CETV2	
Ap1A/138E	4160/990H	CCTV7	
G25/140E	3675/1475R	ORT Moscow	inc. +/- 4.9
	3875/1275R	feeds, tests	
LMAP2/142.5	3675/1475L	occ. tests	+/- 3 deg inc.
Gorizont 33	3675/1475R	tests	+/- 1.2 deg inc
	3875/1275R	RTR	pgme audio 7.5
Ag2/146E	3787/1363H	GMA	P1/2 s. eqtr
Me2/148E	4080/1070H	test card	occ. use
PAS8/166.5E	3880/1270V	test card, feeds	not full time
	3865/1285H	Napa test card	not fulltime
PAS2/169E	3940/1240V	Napa test card	
1802/174E	4166/984R	Feeds	
	4177/973R	Feeds	
I702/177E	4166/984R	Feeds	going to 176E
	4187/963R	Occ. feeds	
I701/180E	4187/963R	Occ. feeds	
	3841/1309L	RFO	East Beam

PAS4/68.5E	3785/1365V	Discovery India	BMAC
	3860/1290H	ESPN India	BMAC
Ap2/76E	3960/1190H	HBO Asia	GI Digicipher2
C2/113E	3930/1220H	Filip. Peo. Net	GI 1.5 MPEG
Ap1/138E	4100/1050V	ESPN	BMAC
PAS2/169E	4028/1122H	ABS/CBN	GI 1.5 MPEG

Satellite "words" - what they mean

Reader Geoff Orr (NZ) suggests, "Is it possible to create a pull out chart of abbreviations of technology used in SatFACTS so that the novice readers and technical illiterate can refer to these definitions?"

A pull out chart makes some sense - trying what follows as a start.

C-band: The satellite downlink band between 3,400 and 4,200 MHz (3.4 and 4.2 GHz). The original C-band was 3.7 to 4.2, but has been expanded down to a lower frequency (3.4 GHz) in the past 5 years to create additional spectrum space for C-band operations.

CA: Conditional access. Requiring a subscription to access.

CAM: Conditional access module, a special plug-in piece of electronics for a receiver equipped to use such a device, allowing a proprietary or multi-service pay-TV "card." The CAM must match the technology of the card and various card-capable CAMs exist.

CI: Common (conditional access) Interface. A multi access pay-TV card interface that is capable of processing two or more different pay-TV format smart cards.

DVB-T: Digital Video Broadcasting - Terrestrial. The transition from the present analogue terrestrial system (which put into force in 1936) to some digital format. DVB-T is a generic term, and does not apply to any specific type of terrestrial transmission.

Feed: The actual "antenna" in a satellite receiving system. Small, installs at "focal point" of the dish, acts as a funnel to transfer energy from the reflector surface into the LNB. Feed is integrated part of LNB in LNBf design.

FTA: Free to air. Transmission is not encrypted, is available either in analogue or MPEG-2 with an off-the-shelf receiver.

IRD: Integrated Receiver Decoder. Not necessarily a decoder in the sense of unscrambling CA services. The IRD is the basic digital receiver, may or may not include CA (conditional access) reception capabilities.

Ku-band: The satellite downlink band in the vicinity of 12,000 MHz (12 GHz). In different parts of the world, Ku band begins near 10 GHz and extends upwards to as high as 12.75 GHz.

LNB: Low noise block (down converter). Installs at the satellite antenna, first amplifies and then converts by frequency translation the incoming C or Ku band signal to a lower wavelength that is compatible with low-cost coaxial cables for transmission from the dish/LNB inside to the satellite receiver.

LNBf: LNB with a feed antenna built into the housing.

MPEG-2: Digital TV transmission standard. Adopted by Motion Picture Expert Group and supposed to be the new, one-world standard for all digital television. Unfortunately, it was not to be.

Parabola: A mathematical equation creating an antenna design ("parabola" or "dish") which happens to work very well at microwave frequencies. The parabola is a specific design which creates a "parabolic" antenna; when the dish is pointed at the microwave transmitter source, all energy from that source is captured by the antenna's reflective surface, and redirected to a focal point where the feed antenna is located.

PowerVu: Scientific Atlanta's proprietary version of MPEG-2. They modify the MPEG-2 bit stream with the clear intent of creating a "soft" encryption system which can only be accessed by their own brand IRD (receivers).

Smart cards: The pay-TV firm issued authorisation card which when backed by a subscription and inserted into a mating CAM or CI receptacle completes the "circuit" turning on the specific IRD for reception.

SMPS: Switch Mode Power Supply. Virtually all analogue and digital receivers now use this particular design of receiver powering. The design is "controversial" because it substitutes low cost for trouble free performance. SMPS supplies are intolerant of high mains voltage, and cannot operate without generating a form of noise interference to attached TV sets (see p. 32, here).

TUNING IN THE INDUSTRY'S TV PROGRAMME

SPACE Pacific, the Asia-Pacific industry membership trade association, has produced (and continues to produce) a series of one hour television programmes. These "SPACE Pacific Report" shows, hosted by Bob Cooper, cover a range of topics of interest to installers and enthusiasts. Show numbers and content are as follows: **#9901-** Spectrum Analyser techniques, **#9902-** Feeds and LNBs, **#9903-** Dish antenna designs and problems, **#9904-** The dish marketplace, and, "tiny parts," **#9905-** Dr Overflow (Nokia) software, **#9906-** How the uplink works (tour of RCA's Vernon Valley site), **#9907-** Uplink Two, including uplink transmitters, **#9908-** Digital Basics (Mark Long), **#9909-** Real World Installs (Mark Long), **#9910** - Installing a polar mount dish and signal level test equipment, **#9911** - "SPIN" (the hidden side of satellite). **#0012** - First Report from SPRSCS 2000 (recorded in Melbourne June 28, 29 - "Ideal IRDs," more), **#0013** - Second Report from SPRSCS 2000 (recorded in Melbourne June 29, 30 - "ABA Blackspot session"), **#0014** - Naughty Nokia from SPRSCS 2000; **#0015** - The DVB-T Tangle from SPRSCS 2000 (Eric Fien). "Report" is broadcast by Mediasat on Optus B3, 12.336Vt, ad-hoc channel 3(*) (Sr 30.000, FEC 2/3) with the following coming-weeks schedule: **Sunday October 15** - Show 0013, 0200-0300 UTC (1500 NZST, 1300 AEST, 1000 Western Australia; repeats 0700 UTC/7PM NZT, 6PM Sydney, 3PM Perth). **Sunday October 22** - Show 9905, repeats same time as October 15; **Sunday October 29** - Show 9906, repeats same time as October 15; **Sunday November 05** - Show 9907, same times as October 15; **Sunday November 12** - Show 9908, same times as October 15; **Sunday November 19** - Show 0015 (Premiere Showing), same times as October 15. (*) - Mediasat may pre-empt showings, check other bouquet channels - such as 5 - if not on 3.) SPACE Pacific Report has also been broadcast by Westlink, Aurora service on Optus B3, vertical (12.595, Sr 30.000, FEC 3/4 - requires Optus Aurora card but is otherwise FTA). Westlink will again carry SPACE Pacific Report when new shows currently in planning are produced and available; details here in future issue (will start after January 1). In the event of schedule changes (*), SPACE Pacific attempts to pre-announce which show(s) will appear through the SatFACTS Web site prior to each weekend (<http://www.satfacts.kwikcopy.co.nz>). SPRSCS 2000 sessions taping scheduled for play on Mediasat and Westlink are currently in "editing production" for presentation which started in September. Sponsorship of SPACE Pacific Report. In general answer to queries - AvComm, Satech and Sciteq have contributed corporate funding to make possible the production of the first set of nine SPACE Pacific Report programmes. Additional funding from Ikusi Australia NZ Pty Ltd. has been received for final production of show 9910. Funds derived from sale of VHS tape copies are also an important element in meeting the (A)\$1,300 overhead of each show. Mediasat and Westlink donate the time to broadcast the programmes, and both are to be commended for this support. Sponsorship of shows is available to commercial groups; contact Bob Cooper (e-mail Skyking@clear.net.nz; tel 64-9-406-0651). During SPRSCS 2001 in Melbourne (September 27-29, 2001) video taping of seminar and conference sessions will be created for future viewing.

WITH THE OBSERVERS

Agila 2/146E: "GMA service P5 in NT but barely P2 here on 3.7m - 3787/1363Hz." (D. Leach, NSW)

ApStar 2R/76E: Kermit channel is being shut down November 1, Hallmark programming modified to include some Kermit material (3720/1430Hz, CA PowerVu).

AsiaSat 2/100.5E: EBB/European Bouquet now has RTPi for sixth TV channel, plans 2 more additions; Portuguese radio channels with RTPi are RDP Antena 1 and RDP Internacional Timor. EBB went bad September 6-7, perhaps because of RTPi addition, causing Pace and Panasat IRDs to display "E65 No TV services available." (Oliver, NZ) New DW representative for NZ is Victoria Quade, tel 04-802-4235, fax 04-802-4236 and email victoria.quade@jcu.edu.au; DW currently feeds programming to 13 NZ TV outlets, 4 radio stations.

AsiaSat 3/105.5E: "Asia Plus is new FTA analogue service on 3635-3640/11515-1510Hz, P5 here on 3.7m." (D. Leach, NSW) Now TV is currently running on two channels, in parallel, within bouquet at 3760/1390Hz, Sr 26.000, 7/8. Also check 3900/1250Vt, Sr26.000, 7/8 for reported NOW testing on a second transponder.

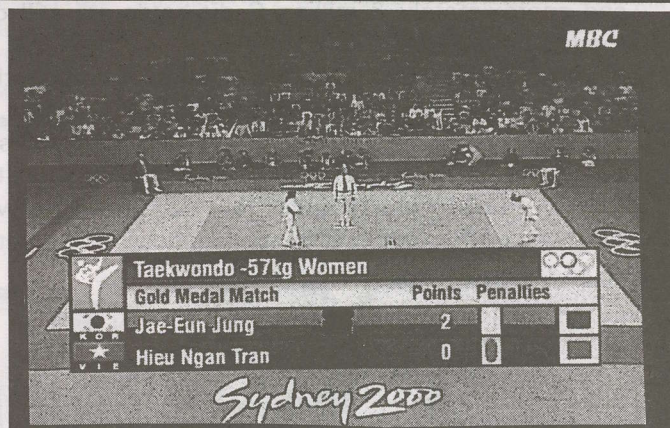
AsiaStar A/105E: Failure. Tests conducted with a 3.7m dish, dipole antenna cut for 1480 MHz, spectrum analyser and L-band line amp at SatFACTS during September failed to produce even a hint of these L-band radio digital signals in New Zealand. The procedure is simple - cut a dipole to 4" overall length (take a piece of RG6, remove the black poly for 2 inches, pulling the insulated centre conductor through a hole poked in the sheath, turning the still insulated clad centre conductor and the looped out shield so they form an overall "dipole" length of 4" - 2" either side of centre). Attach it to a piece of wood (such as a broom handle), connect the RG6 to a spectrum analyser that will tune L-band, set the spec an to 1475 centre and position the wooden handle mounted dipole vertically at the focal point of a dish which is pointing at 105E.

Express 6A/80E: "Footprint map provided by Russians shows 40 dBw peak eirp just north of India, but falling rapidly to under 25 dBw even as it crosses into Indonesia; it is a wonder we see anything at all from this satellite in Australia! RTR (FTA analogue) on 3675/1475LHC is P3 but suffers badly with interference from MRTV at 78.5E" (D. Leach, NSW).

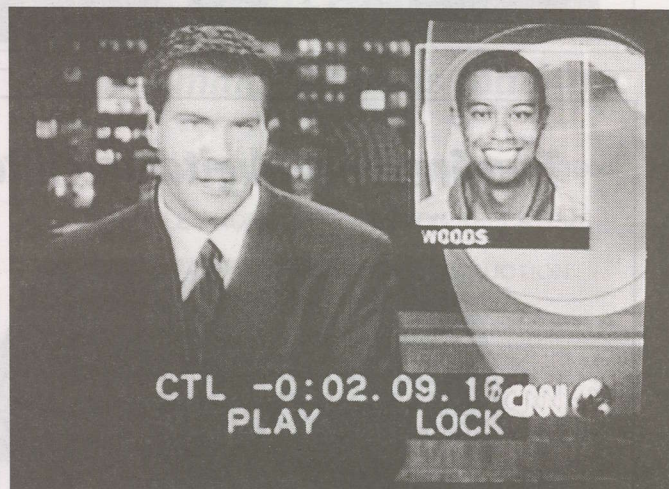
Gorizont 25/140E: "Formerly at 103E; ORT1 on 3675/1475LHC + RHC is P2 here at best on 3.7m, not viewing quality." (D. Leach, NSW)

AT PRESS DEADLINE

Self promotion for AsiaSat majority partner Astra group in Europe appearing on As 2, 3600/1550Vt within Saudi service feed (Sr 27.500, 3/4). Warning: Loading of Zee TV's FTA Asianet Kaveri (within 3700 bouquet) downloads software which corrupts some IRDs operating memory. Advice - have customers stay off this channel totally!



IF YOU MISSED live Sydney Olympics coverage, you simply weren't looking. At peak times, more than 20 (FTA) feeds were visible plus several times as many CA. Below - CNN technical problems sometimes sneak through - including this on screen videotape rewind advisory over top of live video.



Gorizont 33/145E: "RTR on 3875/1275 P1.5 and not usable on 3.7m - they got this one wrong!" (D. Leach, NSW)

InSat 2E/83E: "Digital service on 3910/1240Vt, Sr 5.000, 3/4, is good system check out as signal is strong here." (D. Leach, NSW) Also check 3430/1720Vt, Sr 4.708, 3/4 for Kairali Channel.

Intelsat 505/72E: "Although this bird is inclined and old (launched 1982), telephony and data carriers are big time

WITH THE OBSERVERS: Reports of new programmers, changes in established programming sources are encouraged from readers throughout the Pacific and Asian regions. Information shared here is an important tool in our ever expanding satellite TV universe. Photos of yourself, your equipment or off-air photos taken from your TV screen are welcomed. TV screen photos: If PAL or SECAM, set camera to f3.5-f5 at 1/15th second with ASA 100 film; for NTSC, change shutter speed to 1/30th. Use no flash, set camera on tripod or hold steady. Alternately submit any VHS speed, format reception directly to SatFACTS and we will photograph for you. Deadline for November 15th issue: November 5 by mail (use form appearing page 34), or 5PM NZST November 6th if by fax to 64-9-406-1083 or Email skyking@clear.net.nz.

MORE - Satellite TV in North America

Although Ku-band DTH is now approaching a total reach of nearly 15 million homes, C-band TVRO still exists. C-band viewers are "hooked" on itinerant feeds, hundreds of channels which can carry almost anything at any time with very little notice. TV networks still feeds hundreds of shows across the USA and Canada using these FTA C-band channels and approximately 2 million C die-hards are still out there (photo, right).

DirectTV and DISH (TV), the two major competitive Ku DTH services, are everywhere. For example, a Wal-Mart discount house display of do-it-yourself home TV parts includes the RCA "dual satellite" DirecTV LNB which sells for US\$69 in a wall hanging blister pack with installation instructions.



Satellite TV is everywhere, is an accepted way of life, and most of the mystery is gone. Mobile homes, even long haul cab-over trucks commonly have auto tracking Ku-band dishes mounted on the roofs and the average American or Canadian is never far from his or her satellite TV connection.

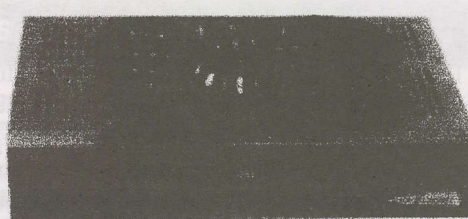


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strong here in 3450-3550 (1600-1700) region right at my horizon." (D. Leach, NSW)

Intelsat 702/177E: Still scheduled to "move" to 176E sometime during month of October (see SF September, p. 31).

LMI 1/130E: "With turn off of NTV and THT services, big loss for Russians in NZ; cannot find beacon here on spec an suggesting bird is moving or in rest mode." (T. Dunnett, Auckland). "When service shut down, inclination near 3.5 degrees and I was tracking every 60 minutes with 3.7m although level still very strong." (D. Leach, NSW)

LMI AP2/142.5E: "Satellite to be moved before end of 2000; good contact at Intersputnik is Josef Dolensky at fax ++7-095-253-9906." (D. Leach, NSW)

Optus B1/160E: Not likely to be a regular feature, but Olympic special channels included 12.675Hz (6.610, 3/4), 12.702Hz (6.610, 3/4), 12.431Vt (4.500, 3/4). (B. Richards)

Palapa C2M/113E: "CNN testing on 3920/1230Hz, far better signal (P5) than regular 3974/1176Vt (P3)." (D. Leach, NSW) MPEG 2 service on 4000/1150Hz, Sr 26.662, 3/4 with ch 1 Big Love, ch. 2 CASA Financial and others CA.

PanAmSat PAS 2/169E: "Fox News in Fox Bouquet, (3992/1158Vt, now CA; feeds on ch. 3 still FTA - Sr 26.470, 7/8." (D. Leach, NSW) Dutch BVN-TV was testing on California bouquet late in September - see SF September, p. 31. Herbalife feed into Australia (for refeeding on B3, Mediasat) is on 3804/1346Vt, Sr 6.509, 2/3 (B. Richards). CMT failures - help line is 61-2-9460-8055 in Australia (Kristy Chong) and 1-707-251-1101 at Napa, if they fail again. "UEC 642 loads Cal Bouquet as 'PAS 8' - could confuse!" (AI)

PanAmSat 4/68.5E: "PanAmSat advises replacement bird PAS-10 will have expanded footprints to include South Australia, WA for first time." (D. Leach, NSW)

PanAmSat PAS 8/166.5E: "Many services FTA for periods of time on 3880/1270Vt, Sr 26.050, 7/8." (D. Pemberton) Also check 4040/1110Vt, Sr 27.686, 7/8. "JEDI/TVB line-up as loaded on UEC 642 (12.686Hz, Sr 28.124, 3/4): (1) TVBJ, (2) Jedi Movie Channel, (3) Spare 1 (FTA test card), (4) TVB 8, (5) Xing He, (6) TVBS Asia, (7) TVBS - N, (8) CCTV4, (9) CNBC, (10) Spare 3 (FTA test card), (11) Spare 4 (FTA test card). Bouquet name is 'TVB Australia'. Of interest, when Jedi Movie loads, EPG was showing several sear words and random keystrokes - somebody playing!" (AI, Qld) "NHK Joho loads as 'NHK PAS2' and ESPN loads as 'PAS-1 Ku-band' on UEC 642. (AI, Qld)

Stationar 6/ 96.5E: "New location for this satellite; RTR on 3675/1475RHC very marginal on 3.7m, P2 at best in SECAM." (D. Leach, NSW)

Thaicom 3/78.5E: "Correction - Channel of Hope is 3551/1599Hz, Sr 13.331, 3/4 with TRT on ch 1, feeds on ch. 2, Hope on ch. 3, 3ABN on ch. 4. You might also try 3551/2599Vt (not Hz) with same numbers - Sr 13.331, 3/4 - for CMS Music Channel. MRTV 3666/1484Hz is gone but analogue feed in NTSC at 3685/1465Hz is still hot." (D. Leach, NSW)

Yamal 102/90E: Advisory from Alexander Zolotnitski, TV6 technical director, says 'We have moved our distribution networks from Express 6-A to the new Yamal 100 which has a semi-global footprint, meaning there is no possibility to downlink our signal in Australia. If there is, in fact, a huge demand for TV6 programming in Australia, suggest you contact local cable or satellite-TV distribution companies to get them to discuss with TV6 various possibilities for delivery of TV6 signal into Australia.' So there you have it - the

Russians have finally figured out they don't have to be FTA, that they can sell their services! TV6 is currently on 3645LHC, Sr 17.900, 3/4 at 90E for those who wish to try. RTR and ORT should be on this satellite as well, at any time. Footprint map shows peak 41 dBw inside of central Russia above India, dropping to below 25 dBw at southern tip of India / Sri Lanka." (D. Leach, NSW)

Errata: Russian ORT is said to be available "live" on Internet from <http://www.lyngsat.com/live/Russia.shtml>. GE (General Electric) 2i satellite scheduled for late 2003 launch will have 60 (!) C-band transponders from 172E.

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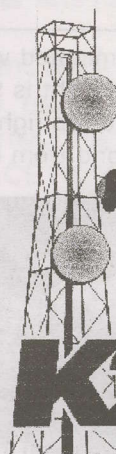
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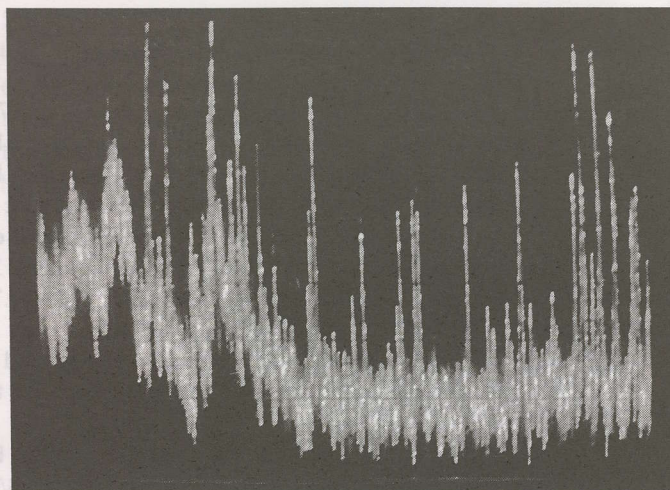
Autosat's response to our tests

For as long as there has been a SatFACTS, we have reviewed equipment. Often, as was the case with the GI DSR 1500 in March 1995, it was a way to introduce you to new technology. The DSR 1500 was the very first available MPEG (1.5 however) or digital satellite receiver. We learned about digital thresholds, tiling and erratic audio in our tests and by passing the information on to readers prepared the way for the digital revolution that followed.

We reviewed the Benjamin DB 6600CI in August and promptly heard from Australian distributor Ming Leu of Autosat. In particular, he was concerned that we found SMPS (switch mode power supply) noise in the "RF Out" fitting. SMPS devices are infamous for generating noise (radio frequency interference) and as we observed in some detail on p. 8 of the same August 2000 issue, *"The SMPS is actually a radio transmitter with components operating under 'heavy stress'. What makes SMPSs cheap (their primary attraction) is what makes them unreliable and noisy (generators of radio frequency interference)."*

The RF Out fitting is where you connect the satellite receiver to the TV set (if not using A-V lead connections). There is also an RF In fitting where the terrestrial aerial plugs in. We reviewed a Pace model IRD used by Sky NZ and found very poor isolation between the RF Out and RF In fittings; much of what was supposed to only come "out" was also present on the "in" fitting as well. Which means the TV aerial connected to the "in" was receiving IRD generated interference and we expect radiating it over the neighbourhood.

If a receiver becomes a transmitter and the transmission energy flows out of the RF Out spigot, it ends up inside of the connected TV set(s). Switch mode design supplies generate "hash" (a frequency modulated broadband noise spread over tens of megahertz) and they also generate spot-frequency carriers. The 6600CI generates both modes as you can see from the spectrum analyser display upper right.



RF output of Benjamin DB 6600CI. Left hand side, 45 MHz (Australia/NZ channel O/1), tall "spike" on left is at 92 MHz, middle of screen is 190 MHz, far right is 340 MHz. See text.

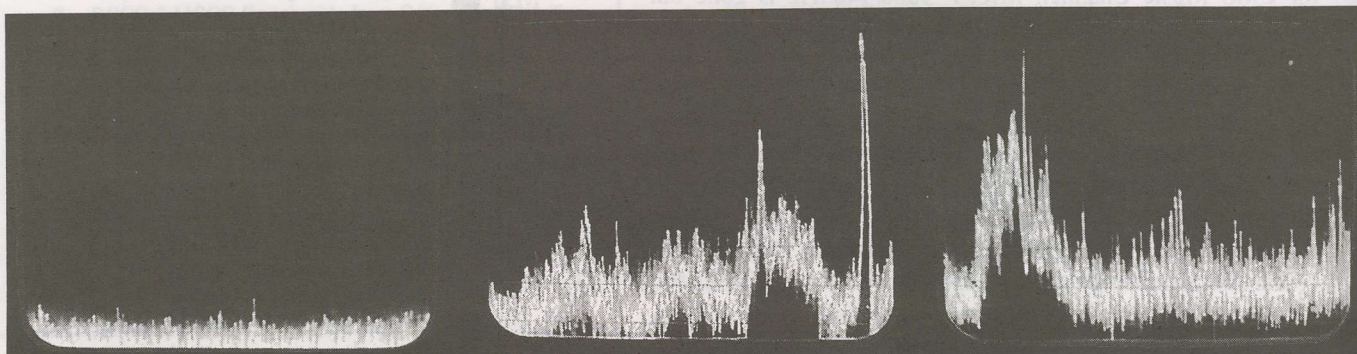
Ming Leu said neither his factory nor his shop could locate the noise we found. Here is how we conduct this measurement:

- 1) We terminate the RF In fitting with 75 ohms
- 2) Place a 6 dB "pad" in line with the RF Out socket going to the analyser. The pad helps correct for impedance mismatch and ensures better measurement accuracy.
- 3) Terminate the 75 ohm input on the analyser and adjust it for bottom of screen -40 dBm display sensitivity.
- 4) Substitute the RF out (through 6 dB pad) line coming from the IRD and measure the results.

In bottom left photo, you see the analyser terminated. That is no input. Middle, and right, two different chunks of spectrum from 45 to 175 MHz. The frequency modulated "hash" in the 45 - 80+ MHz region is clearly visible. So too some potent single frequency carriers (the one near 92 MHz measured a whopping 50+ dBuV).

The Benjamin DB 6600CI is no worse (nor better) than any other SMPS powered IRDs we have measured. When hash and power supply generated spikes are created, and are fed directly to the TV set, interference is inevitable. Hash noise appears as "snow" on previously clean terrestrial signals; spikes if they fall inside of a TV channel normally received, create herringbone interference patterns, shoddy audio. Solutions? Try p. 32 for SF, September. Oh yes, also see p. 4 here for the balance of Autosat's concerns.

Bottom left - spectrum analyser terminated with 75 ohms; centre of screen is 140 MHz. **Centre** - middle of display is 68 MHz, strong "spike" at right is 92 MHz carrier seen in top photo on left hand display (this display spreads out the lower 50 MHz of the top right hand display). **Bottom right** - left hand side is 75 MHz, strong 92 MHz spike is second from left, other spikes fall between 90 and 175 MHz.



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OBSERVER REPORTING FORM - Due November 3, 2000

- NEW programming sources seen since October 1st: _____
- Changes (signal level, transponder, programming content) in pre-existing programming sources since October 1st: _____
- OTHER (including changes in your receiving system): _____

NOTE: Please use P1 - P5 code when describing signal levels and receiver IF/RF settings.

Your Name _____

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CLIP and POST - Updated TARBS Pay TV List from PAS 8

With the unexpected shutdown of the Russian NTV and THT services on LMI AP1 (130E) and the migration of Russian services to the TARBS PAS-8 Ku bouquet(s), there is renewed interest in what TARBS is doing.

As of early October:

12.526Hz, Sr 28.067, FEC 3/4: (13 TV, 13 radio).

TV Channels (all CA): (1) RAD = Sky Racing (& Adult at night); (2) ESPN, (3) CNN, (4) MCM (same as MCM from As2), (5) TCM, (6) ESC (was Egyptian on As2), (7) NDM, (8) FUT, (9) NTV (Russia - was on 130E), (10) NTVP, (11) KDTV, (12) ATV, (13) TGRT.

Radio Channels (mostly FTA): (1) EBE, (2) ESEA, (3) EQK, (4) ELEH, (5) RA65 - not currently in use, (6) TGR, (7) RD, (8) RDSP - recently added/new, (9) RA69 - not currently in use, (10) RA70 - not currently in use, (11) DW1 (may be CA), (12) DW2, (13) REE

12.606Hz, Sr. 28.067, 3/4 (13 TV, 3 radio)

TV Channels (all CA): (14) TS15 (may not be in use), (15) MKTV, (16) TVP, (17) DW, (18) TV Chile, (19) TVE (same as TVE AsiaSat 2), (20) TI (Tele Italia - custom to TARBS), (21) MEGA, (22) KOTV, (23) PHOE (Phoenix - dissimilar to Phoenix on As3), (24) Dragon (CTN, Chinese TV), (25) TFC (The Filipino Channel), (26) PBC.

Radio Channels (FTA): (14) RA74 (not in use), (15) RA75 (not in use), (16) DZMM (Philippines)

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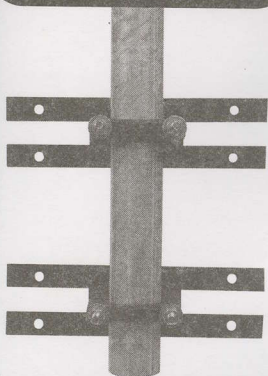
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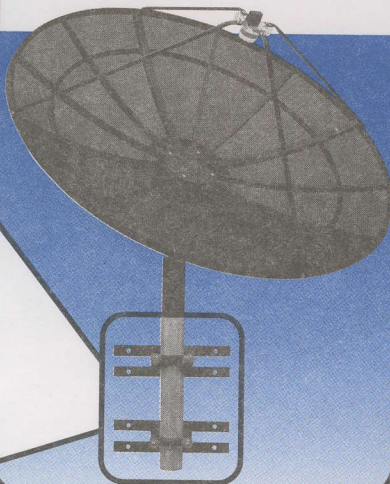
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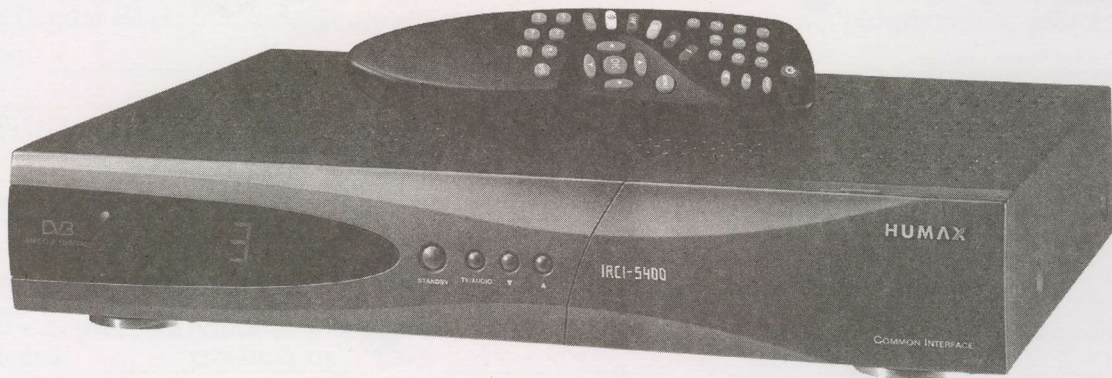
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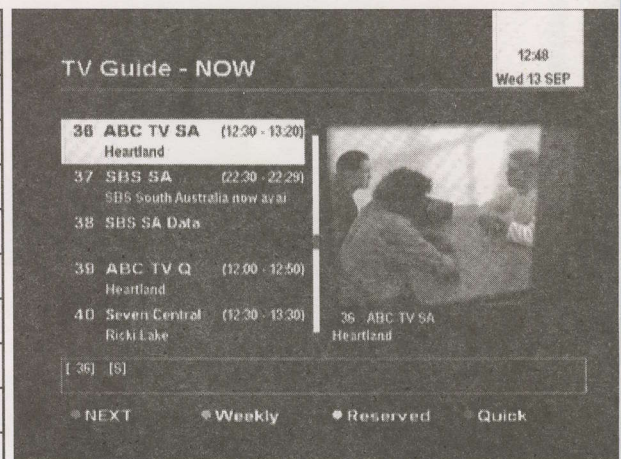


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